Samuel Gurney.

Trinity College,
Oxford.

The Norfolk Club.
Norwich.

Janet Stone from her cousin
Sam Gurney.

Frontispiece. A. Horsley Hinton.

REQUIEM.

SECOND EDITION.

THE PRACTICAL PHOTOGRAPHER.

Library Series. October, 1903. No. I.

The Pictorial Work of A. Horsley Hinton.

By THE EDITOR.

AMONG those who, at the present day, form the "front rank" of pictorial photographers, we must unquestionably place Mr. A. Horsley Hinton. In addition to being a maker of pictures, which have given infinite pleasure to thousands, he is also a prolific writer upon matters photographic and artistic. And in addition to the making of pictures and the making of books, not only does he find time to edit an important weekly photographic journal, but also, like most really busy men, he finds time for several other intellectual pursuits.

Among those who only know him, or know of him as a pictorial photographer, there must be many who will be keenly interested to know something about his aims and ideals, his methods of working, his early efforts and some other of the many things which together go to make up that indefinable, subtle something which we call "personality." In his case this individuality or personality is particularly interesting, because it would indeed be no easy task to name any other worker who has during the last ten years exercised upon pictorial photography so widespread or far-reaching influence.

It will, therefore, come somewhat as a surprise to not a few to learn that Mr. Hinton is yet a young man. In fact, he is hardly yet within "nodding distance" of forty years. It may perhaps be a further surprise to learn that he was not born amid those country surroundings which he has abundantly shown us he loves so well and portrays with such genuine sympathy. A Londoner by birth, he is yet another link in that long chain of Nature's lovers which includes among its links some of the greatest English landscape artists who have spent the greater part of their early days among bricks and mortar, and not among the leafy lanes and flowery dells of the open country.

How many of us town dwellers daily pass some building or other large object, and yet cannot give as accurate an account of its appearance as our country cousin who sees it for the first time. While we, spending a few days in the country, may perhaps notice hedgerow objects unseen by him. Thus does change of surroundings tend to quicken observation. Hence, perhaps, the foundation of the saying, "What we always see we never see."

But beyond the ordinary powers of superficial observation the artist must go further. He must not only observe, but also discriminate between the commonplace and the pictorial. And it is this "plentiful lack" of discriminative observation that falls like a consuming blight upon perhaps ninety-nine out of every hundred ordinary landscape photographs. In this connection it is of interest to record that Mr. Hinton's mental aptitude for keen observation is not limited to noticing the form and colour, tint and tone of the trees swaying in the wind, the rolling uplands or breezy moor, the nodding cornfield or wind-driven cloud chariots in the sky—not limited, as is the case with many painters, to merely observing what is immediately useful in their craft, but, like the great master, Ruskin, every wayside flower or fluttering insect has for him an individual and specific interest. It is not enough to be familiar with their scientific names or classification. He takes pains to observe their various forms, markings and characteristics.

It is pleasant to know that this early-formed love of natural history, using this term in its true sense, has been and is yet kept fresh and green right up to the present time.

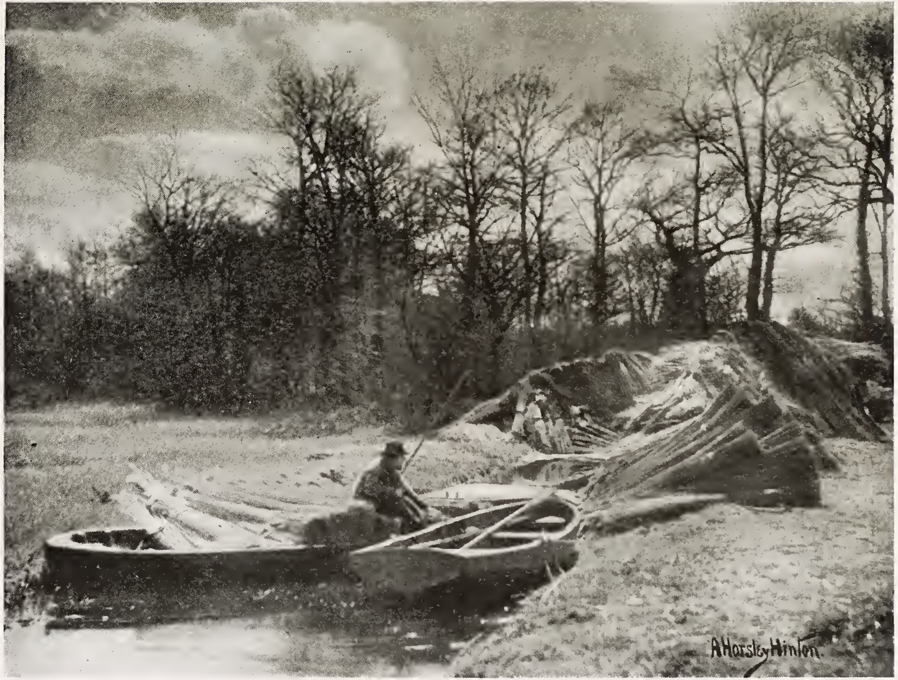

Fig. 2. A. Horsley Hinton.

REED HARVESTING.

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In Mr. Hinton's case heredity does not seem to have played any important part as regards his art tendencies or abilities. Nor can we trace much help in this direction to school influence. But when, about twelve years of age, he began sketching from Nature in what one may term a self-taught way, and by chance it fell out that about this time he made the acquaintance of one James Peel, a landscape painter, who gave young Hinton considerable encouragement though not much assistance. With gathering years the innate love of drawing strengthened with increasing skill and experience, and also ripened and widened in general tendency.

No wonder, then, that the young sketcher should presently see how a camera could be made to render valuable help by rapidly securing the drawing of some foreground bit, a clump of Reeds, a tuft of Hawkweed, or a branch of trailing Ivy. Thus came the natural step from the pencil to the lens. Let us not fail to notice that it was *foreground* studies that led to replacing the pencil by the camera. Soon after this appeared the remarkable book, "Naturalistic Photography," by Dr. P. H. Emerson. This in turn had no little influence on our sketcher-photographer.

Unlike most artists, Mr. Hinton does not seem to have any special favourites among poets, dramatists, or musicians. But while he lays no claim to be a performer, yet he has the keenest appreciation and enjoyment of music.

In his own photographic work we find him of a conservative type or tendency as regards subject. Pure landscape was his first love, and to this he has been constant. Essex was his first happy hunting-ground, and although he has made occasional excursions into the dales of Yorkshire and elsewhere, yet always to Essex he returns.

Formerly he would often use a camera of somewhat formidable size for the making of large negatives direct. Latterly he tends more to the use of a somewhat smaller original negative, primarily made with the aim of obtaining enlarged negatives. His pictures convey the impression of a somewhat narrow pictorial angle—in other words, the use of a moderately long focus lens. It is particularly interesting to put on record the fact that Mr. Hinton has for his own pictorial work invariably used colour-corrected or orthochromatic plates ever since they became articles of commerce in this country. He prefers a somewhat thin, delicately granulated negative. As to printing processes, platinotype comes an easy first favourite, although carbon, *i.e.*, autotype, is frequently used.

It has been our privilege during the last ten years or so to see quite a considerable number of Mr. Hinton's pictures, but we do not recall having seen any gum-bichromate prints, or any prints from pinhole-made negatives.

As regards the far-reaching question of sharp v. fuzzy, there seems to have in some strange way got abroad a very general impression that Mr. Hinton is an exponent of the extreme fuzzy style of work. This view is certainly not upheld by any one of his many photographs that we have seen. Our own impression is that he is not an extremist in either direction. We do not recall ever having seen any single example of "dead-sharp-all-over" print on the one hand; or, on the other, any example of pronounced fuzziness.

Examination of the six typical reproductions will be found to support our impression. In general we may say that his method seems to be the quite rational one of having the chief planes or objects of pictorial interest sufficiently sharply defined to hold attention without being so sharp as to weary the eye with needless detail, while the rest of the composition is softened in definition sufficiently to give breadth of effect without being so far out of focus as to introduce confusion or destruction of texture.

Thus in Fig. 1 the vessel claims our chief attention, and is the sharpest part. In Fig. 2 the boatman, boat, and reeds are all sufficiently sharply defined. In Fig. 3 the distant tree-trunks come out strongly against the light sky beyond. In Fig. 4 the head and figure are duly differentiated from the slightly softened natural background, and so on with the other examples.

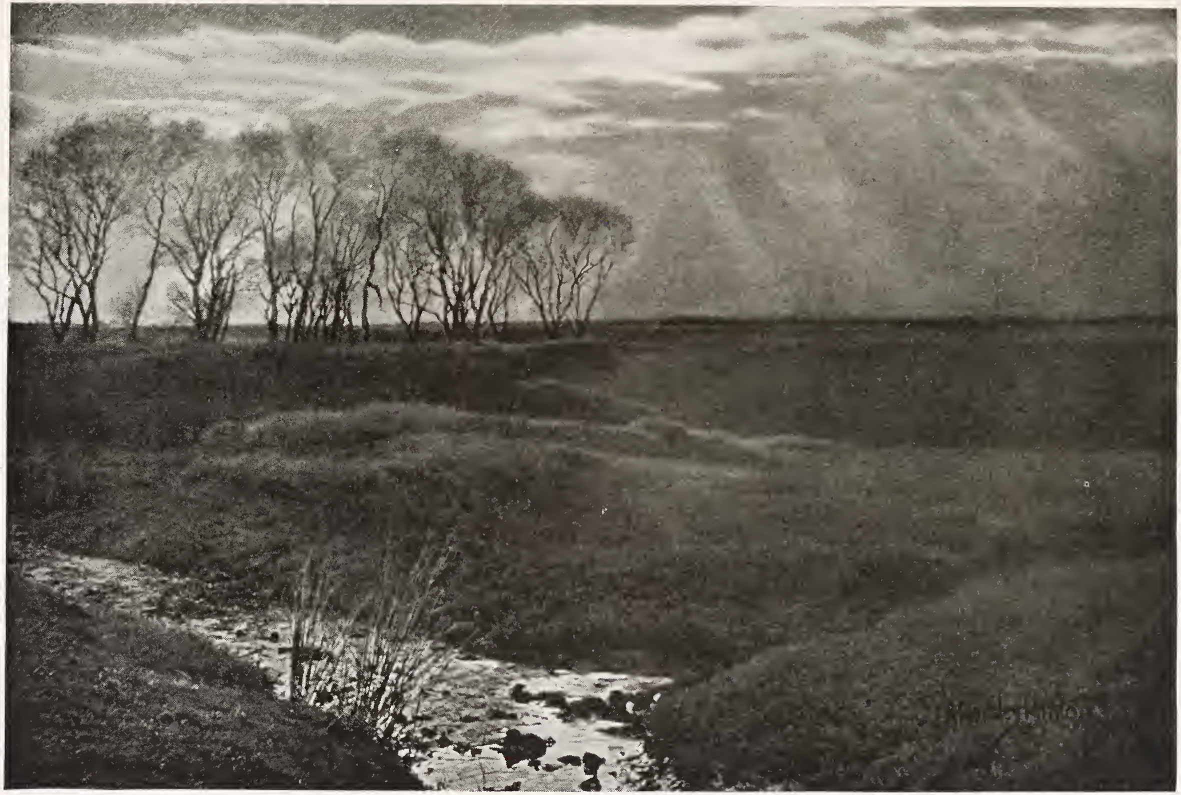

Fig. 3. A. Horsley Hinton.

SUNSHINE AND RAIN.

We cannot examine many of Mr. Hinton's pictures without learning that he regards the negative as a means to an end. Hence we learn without surprise that he has no hesitation in using two or more different negatives wherewith to build up his compositions. Thus he may use a sky from one, distant hills from another, and foreground from a third.

Should the purist object to such results or methods, Mr. Hinton might reply that his prints are not intended to be survey records of any particular place, but rather pleasure-giving arrangements of form, light and shade; the resulting print, if it be pleasure-giving, justifying its methods of production, call them photographic or not, as you please.

Mr. Hinton, while freely admitting the valuable drawing and detail-recording powers of photography, does not think it needful to use these powers to their full extent except on rare and special occasions. On the other hand, he is fully conscious of its inherent limitations as a picture-making process, and, of course, does not deny to others as much liberty of choice and modification of method as he himself uses.

Viewing his work generally, one cannot but feel that if no other examples existed, his pictures alone would be enough to show that there is such a thing as personality or style in photography, just as much, though not quite in the same way, as in drawing or painting.

Probably his fairly well-marked style may largely account for his having suffered more from futile imitation than most front-rank workers. Usually the imitator is a person without much originality or keen observation. More often than not he entirely fails to notice the characteristics of his model. Unthinkingly he thinks that by superficially imitating his master's subjects he will obtain the same results, ignorant or heedless of the fact that it is *treatment* and not *subject* that characterizes valuable work.

It is easy to see that, among other features, three things strongly characterize Mr. Hinton's work. First, he relies largely on chiaroscuro, or the arrangement and balance of light and shade. Next, he pays considerable attention to the selection and arrangement of the foreground part of his compositions. And last, but not least, the sky and cloud part is made to contribute largely to the general effect. The student of pictorial photography will do well to bear these three points in mind, not only when examining Mr. Hinton's results, but also the work of other picture-makers.

The limitations of available space prevent our entering into a detailed analysis of the works which Mr. Hinton has kindly allowed us to select and reproduce in as full a manner as their highly instructive character suggests. We must, therefore, limit ourselves to the briefest possible notes.

The accompanying six pictures are here annotated according to the chronological order of their original production, and were selected to show the variations of style and subject extending over this period.

1. **Reed Harvesting.**—This picture was awarded a medal some ten or twelve years ago at the R.P.S. An instance of the employment of a figure in the composition. The chief theme of interest is in the foreground, while much of the pictorial force is due to the balance of light and shade in the sky. Note the breadth of treatment of the leafless trees.

2. **Requiem.**—Here our chief attention is claimed by the vessel in the middle distance. Just behind this we see the cloud curtains of coming night gathering round the death-bed of parting day. The absence of living things, the conspicuous simplicity of the whole composition, the old pier and boat, the deserted shore, all echo the thought of Requiem —rest, calm and reposeful. The forceful effect of a simple composition should be especially noted.

3. **Sunshine and Rain.**—Here we have nature seen under quite a different phase. After a driving rainstorm come rifts in the clouds, and Sol with gilding hand touches the edges thereof, and shoots his arrows through these cloud-chinks. The foreground with conspicuous self restraint is kept strongly simple, so that it shall not compete with the breaking light beyond the trees. The horizontal banks of clouds are in harmony with the flat marshy land.

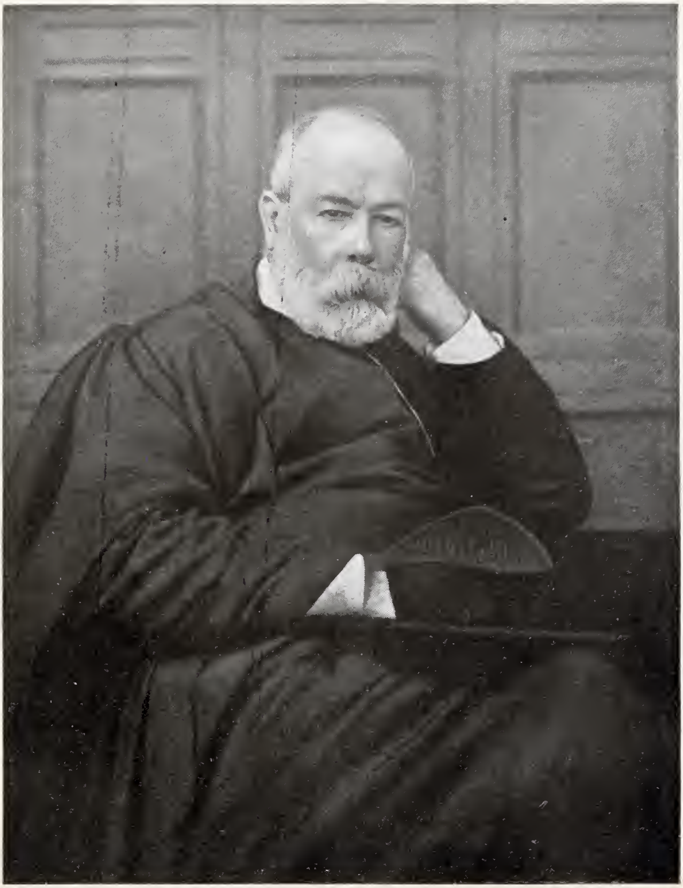

Fig. 4. A. Horsley Hinton.

PORTRAIT.

4. **Portrait.**—This is not only an admirable portrait study, but is proclaimed by those who know the sitter to be also an excellent likeness. The straight-line nature of the panelled background forcefully helps to give interest to the flowing lines of the figure. As in all good portraiture our chief attention is claimed by the head, though the other parts of the picture are not without considerable instructive value. It is of special interest to note that this work has not previously been published.

5. **Sylvan Solitude.**—A valuable example of the importance of chiaroscuro. Note the concentration of light along the path, leading the eye to the large rock, and so to the chief light in the sky. The margins of the picture are kept comparatively dark and quiet. The distant planes are duly subordinated in definition, while our chief interest is kept in the near parts, partly by sharper definition, partly by crisper contrasts and a longer range or scale of tones.

6. **Weeds and Rushes.**—This shows how so simple a thing as a clump of water-weeds and rushes may form the chief theme of an important composition, and again points the moral of paying great attention to the foreground. The distant bit of hill, though occupying a relatively small proportion of picture space, is of great importance in conveying the feeling of space and distance. Above is a sky which gives power and dignity to a landscape which, with a blank sky, would be not a picture, but merely a study for a picture.

Thus, careful study of Mr. Hinton's work teaches us many valuable lessons. For example, the great importance of the foreground, the power of the sky and cloud in suggesting sentiment, the advantage of a broad scheme of chiaroscuro, and that pictorial effect is not a matter of sharp focus or blurred images, but of harmonious personal treatment of such subjects as engage the worker's genuine sympathy.

Practical Introduction to "Bromide Printing."

By JOHN A. HODGES, F.R.P.S.

AMONG the more prominent advantages of Bromide Printing the following may be mentioned: Simplicity, range of colour obtainable, expedition, independence of daylight, adaptability to negatives of widely different characteristics, economy, and the artistic quality of the prints.

Advantages. In enumerating the advantages of bromide paper "expedition" was referred to, and this attribute suggests a more rapid, and therefore more sensitive, medium than P.O.P. for instance. Bromide paper is, in fact, paper coated with a slow gelatino-bromide emulsion; and although its rapidity is much less than even a slow dry plate, similar precautions to protect it from exposure to actinic light—day or artificial—must be adopted; therefore, except during printing, it must only be manipulated in red or yellow light.

The paper can be obtained either packed flat in cut sheets of the usual photographic sizes or in rolls. The paper is usually packed in two envelopes of thick black paper fitting into each other, both of which are necessary to properly protect it from light, all black paper containing numerous minute holes, through a single thickness of which the light would pass and produce upon development opaque black spots on the prints.

Variety of Surface. One undoubted advantage of the process is the great variety of surface obtainable, which is in itself an inestimable boon to those who use photography as a means of artistic expression. The smoothest papers present when finished a highly glazed surface, which may be heightened by squeegeeing. These are called "enamel" papers, and are useful when it is desired to preserve as much detail in the

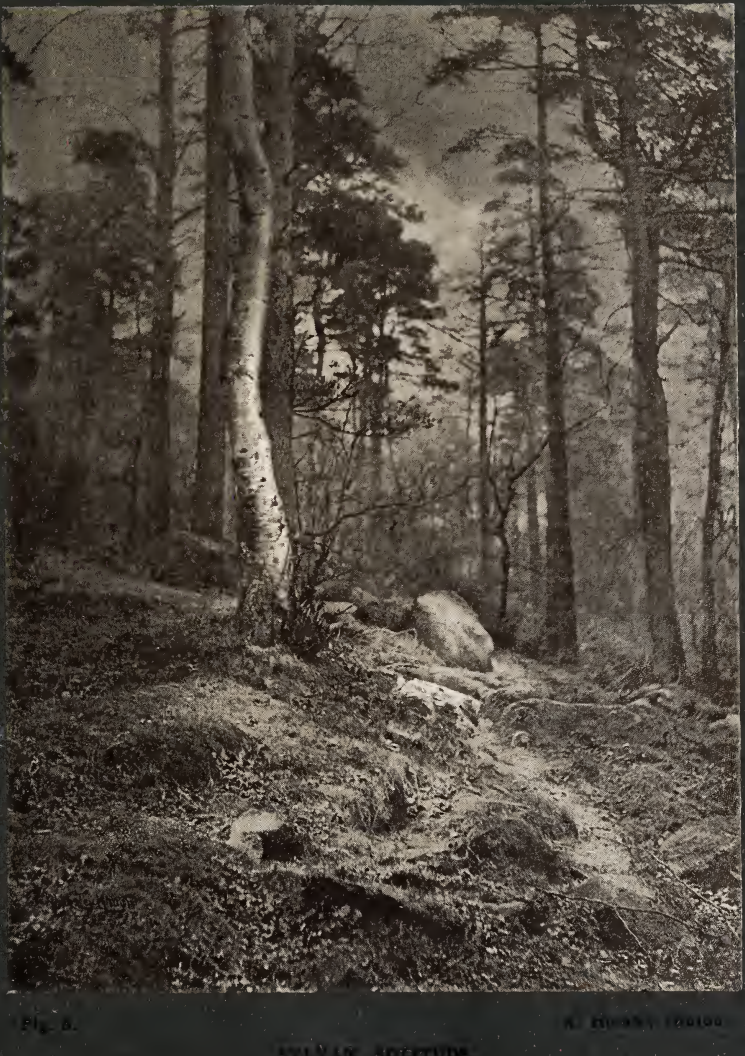

Fig. [illegible] A. Horsley Hinton

SYLVAN SOLITUDE.

print as possible; as, for example, in photo-micrographic work or in making prints for reproduction. Slightly rougher in texture and with a smooth matt surface comes the class of paper known as "smooth bromide." This is probably the variety most generally employed, for it combines the advantages of a pleasant matt surface and at the same time yields abundance of detail. The next grade is a similar paper, but with a perceptibly rougher surface, somewhat akin to ordinary cartridge paper, and is extremely useful for general work of an artistic nature. Both this paper and the last may be obtained either white or tinted, and should be referred to in ordering as either "smooth," "rough," "tinted smooth," or "tinted rough." For very broad effects or large work several makers coat the rougher grades of drawing papers, which for special purposes are extremely valuable. Both the smooth and the rough varieties of paper are manufactured in two speeds, slow and quick. The former should be chosen for thin, delicate negatives, and the latter for dense ones, the slow paper tending to give a brilliant, plucky print, and the rapid a softer and less "contrasty" picture.

During the last two or three years a new class of bromide paper has made its appearance, all varieties of which may be included in the generic name of "gaslight" papers. Probably the "Velox" paper, introduced by Messrs. Griffin, was the first to make its appearance in this country, and it is still one of the best. All "gaslight" papers are very much slower than ordinary bromide paper, and may be safely developed in weak actinic light—*e.g.*, that afforded by an ordinary composite candle. They represent a distinct type of printing media, and it must be clearly understood that to attempt to manipulate ordinary bromide paper in the same manner as gaslight paper would be to court certain failure.

Manipulation. The necessity of a safe light in which to conduct the operations of filling the printing frames and developing the paper has already been referred to. Artificial light is preferable to daylight by reason of its greater uniformity. The writer uses two thicknesses of canary medium—a kind of yellow cloth procurable at the dealers—pasted to a piece of ordinary ground glass. This affords a soft, safe, and evenly diffused light when placed in a lantern illuminated with an ordinary hard carriage candle. If daylight is used, at least three, and possibly more, thicknesses of the fabric must be employed, and, moreover, the material must be frequently renewed, as it quickly bleaches under the action of daylight.

Care must be taken to avoid any unnecessary handling of the paper, as any slight abrasion or scratch or contact with damp, perspiring, or dirty fingers would cause marks and blemishes to appear on development in the print. It is quite easy, with but little practice, to avoid touching the sensitive surface altogether. Some difficulty may, however, be experienced in distinguishing the coated or sensitive side of the paper; but this may be overcome by remembering that the coated side always curls *inwards*, and this tendency may be increased by gently breathing on the paper. If a doubt still exists, it may be at once solved by nipping the extreme edge of the sheet between the teeth, to which the coated or sensitive side will adhere.

After removing the piece of sensitive paper from the envelope, make it a rule to at once replace the remainder; for nothing is more annoying than to find when the door of the dark-room is subsequently opened that the unexposed paper has been left out of its package and spoilt. The negative, after being carefully dusted, is placed face up in the printing frame, the piece of bromide paper superimposed, the back replaced, and is then ready for exposure.

Printing.

Different authorities prefer different forms of illuminants for this purpose, and so long as uniformity can be obtained its nature is a matter of small moment. Daylight, which some advocate, should, however, be avoided, its intensity being so variable as to render it exceedingly difficult to control. Gaslight, by reason of its comparative uniformity, answers admirably; but any illuminant, be it the electric light, oil, gas, or candle, may be successfully employed. The *desideratum* in bromide printing is uniformity of the conditions under which the exposures are to be made. To

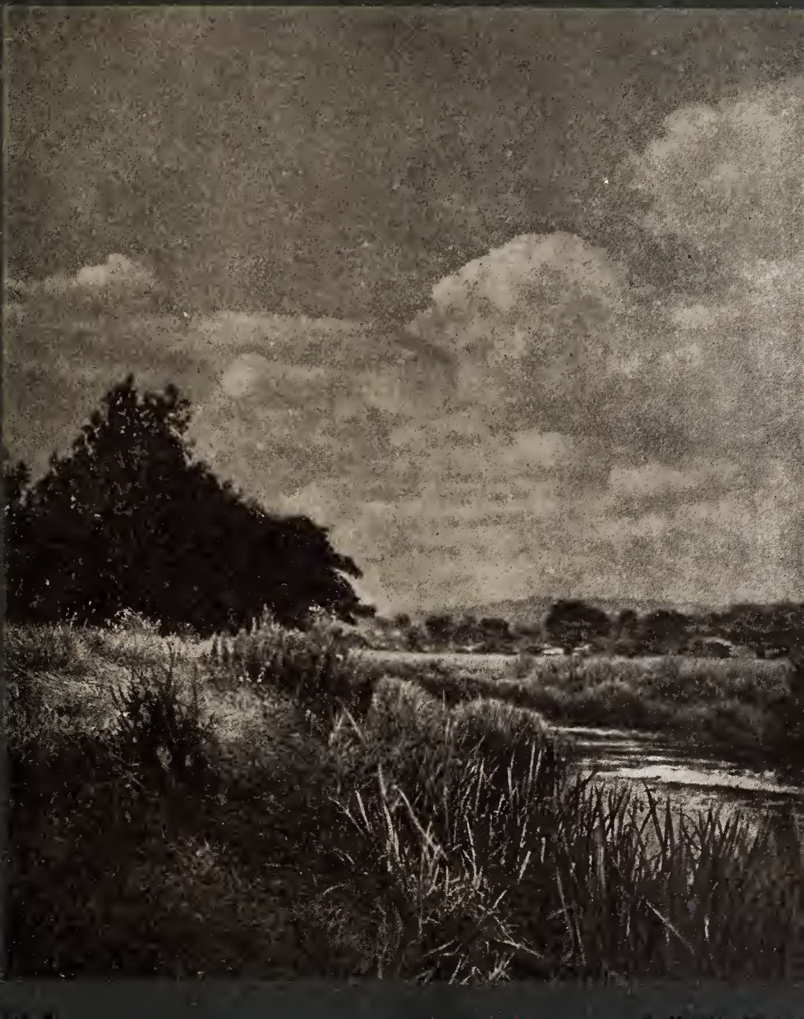

Fig. 6.

J. Horsley Hinto

WEEDS AND BUSHES.

secure these the light must be of an approximately constant intensity; if gas or oil be used, the flame should be turned up full, the paper must be of the same rapidity, the negatives of practically equal density, and the exposure always made at the same distance from the light. When the correct exposure for a given negative has been once ascertained, it can be entered in a note-book and a similar result obtained at any future time..

Cleanliness and orderly procedure are powerful factors in securing success in bromide printing; and as the ready command of plenty of clean water is almost a *sine qua non*, if that commodity is not laid on to the dark-room, the most convenient method of working would be to carry a good-sized deal table to the bath-room. Three porcelain dishes a size or two larger than the prints must be provided—one for developing, one for washing, and one for fixing. Each must be kept scrupulously clean and reserved for its exclusive use. Preference is given to porcelain because the material is easily kept clean, and chemical dirt or stains can easily be detected. Dishes should never be put away dirty, or left standing after use with solution in them, or ineradicable stains may be produced. Before being put away they should be gently rubbed with dilute hydrochloric acid (acid 1 part, water 10 parts), and then well rinsed.

When at work put the fixing dish as far away from all the other dishes as possible, for the slightest trace of hypo, whether dropped from the dish or conveyed by the fingers, coming in contact with the paper before, during, or after development prior to its being placed in the fixing bath will ruin the prints.

Exposure. A piece of bromide paper having been placed in the printing frame in contact with the negative, and the precautions already insisted upon duly observed, the exposure is made by holding the frame to the light. The quality of the print will to a large extent depend upon the correctness or otherwise of the exposure, therefore every effort should be made to estimate it correctly. The intensity of the light diminishes as the distance between it and the printing frame is increased; therefore, in order to secure uniform results, it is necessary to make the exposures at a known distance from the light. For instance, if we place the printing frame at a certain distance—say three feet—from the source of light turned up to the fullest extent, and find that 6 seconds' exposure gives on development a bright, well-exposed picture, we may at any future time, by repeating the same exposure under the same conditions, obtain identically similar results. It is, of course, obviously impossible to suggest definite exposures without knowing the actual conditions under which they are to be made, such as the intensity of the light, the density of the negative, and the rapidity of the papers, because the various makes of paper differ considerably in this respect. The best plan for the novice to adopt is to make a series of graduated exposures with the same negative of, for instance, 6, 8, 10 and 12 seconds, using a normal developer in each case, and carefully compare the resultant prints.

Errors of Exposure.

But the novice might experience some difficulty in recognising the effects of under and over-exposure, and in discriminating between the results so produced and those due to under and over-development. We have therefore endeavoured to show, by means of a series of reproductions produced from bromide prints in which the various errors exist, the characteristic appearance of each defect; and a careful study of these will probably be of more practical value to the student than many pages of instruction. Fig. 7 is an example of an under-exposed print. Under-exposure is indicated by the slowness of the appearance of the image and the lack of detail in the print. It is assumed for the present purpose in each that what has been referred to as a "normal developer" has been employed, the actual development and the composition of the developer being fully described hereafter.

Over-exposure.

Fig. 8 is an illustration of the result of over-exposure; the print is flat and the details seem to be buried. The fault is indicated by the image rushing out, as it were, immediately upon the application of the developer.

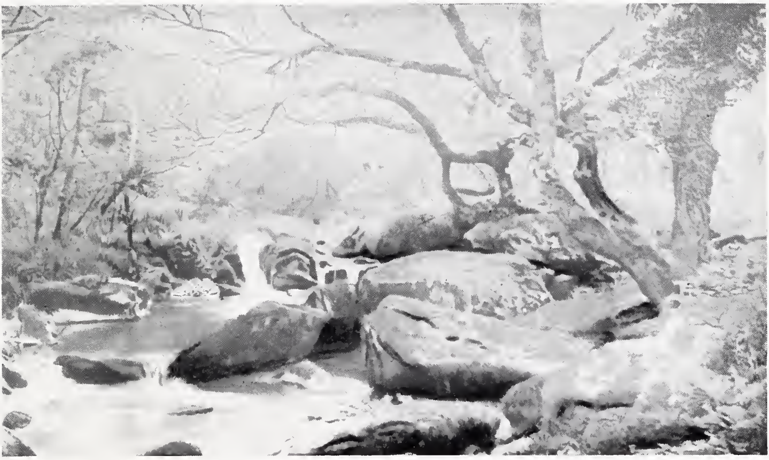

Fig. 7. J. A. Hodges.

UNDER-EXPOSURE.

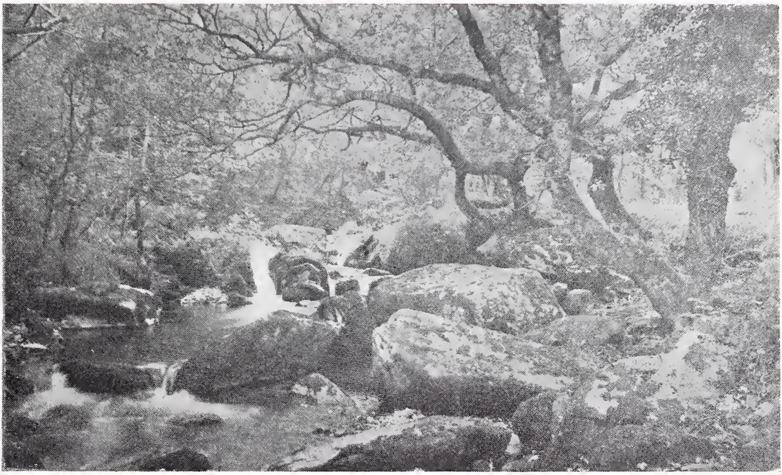

Fig. 8. J. A. Hodges.

OVER-EXPOSURE.

Correct Exposure. In Fig. 9, by way of contrast, we have an illustration of the appearance that a correctly exposed bromide print should present. The gradation of the picture is harmonious throughout; the detail is abundant even in the high-lights, which, although well-marked, are not hard or aggressive.

Under and Over-development. But correct exposure alone is not sufficient to ensure the production of a perfect bromide print; its development is not a merely mechanical operation commencing and finishing automatically. A correctly exposed print may be spoilt by (1) under-development, *i.e.*, removing the print before the developing action has been carried sufficiently far; or by (2) over-development, that is to say, keeping the print too long in the developer, and consequently allowing its action to proceed too far. Fig. 10 is an example of under-development, and Fig. 11 shows the appearance of an over-developed print.

Over and under-development are sometimes mistaken by beginners for under and over-exposure, and the reader will profit by a careful comparison of the reproductions illustrating these defects. The most reliable indication of the nature of the error, however, is afforded by the behaviour of the print during development.

The Negative. One great advantage of the bromide process is its great elasticity in regard to its demands upon the negative. The trite saying that every printing process requires a special type of negative to produce the best results probably applies with less force to the bromide process than to any other. For this reason it is essentially a beginner's process, for his negatives are likely to be of somewhat varying quality.

A negative that will yield most readily and with a minimum of trouble the most perfect bromide prints, the production of which should be aimed at, will exhibit the following characteristics:—It will be sharp, free from fog, stain, or veil, be correctly exposed, possess a good gradation, and be neither unduly dense in the high-lights nor too clear in the shadows. This is the type of negative which the beginner should aim at producing, for his ideal in the direction of technical perfection cannot be too high. It is quite true that from the artistic point of view such a *cliché* may not be the most suitable for producing a particular effect, but a thorough mastery of the *technique* of his art in the initial stages of his photographic training will give him greater facility in producing any particular type of negative that may be required for some special purpose.

The Developer. Almost any developer used for negative work *may*, with slight modifications, be employed for developing bromide prints, but in practice some are found to be much more suitable than others. The formulæ given below have either been worked out independently or thoroughly tested, and are all reliable and trustworthy. The reader is strongly advised to select one of these and continue its use until he is able with tolerable certainty to produce fairly good results, and to defer experimental work until he has gained some experience. We desire to emphasize this advice because the reader will probably find that every photographic friend to whom he may recount his failures and difficulties will attribute them to the developer employed, and straightway recommend some particular formula of his own. It is well therefore to bear in mind that in nine cases out of ten the fault lies, not with the developer, but with the person who uses it.

Ferrous-oxalate. Ferrous-oxalate was for long regarded as the most suitable of all developers for bromide paper, but it has now been superseded by others.

Pyro. Pyro, although it may be used for the production of brown-coloured images, is not a suitable developer for bromide work on account of its tendency to discolour or stain the prints, and for this reason its employment is not advised.

Hydroquinone. Hydroquinone is a good developer for bromide paper when a suitable formula is used, but is apt to produce harsh prints with a tendency to excessive contrast. It works best in conjunction with metol. It is apt to produce

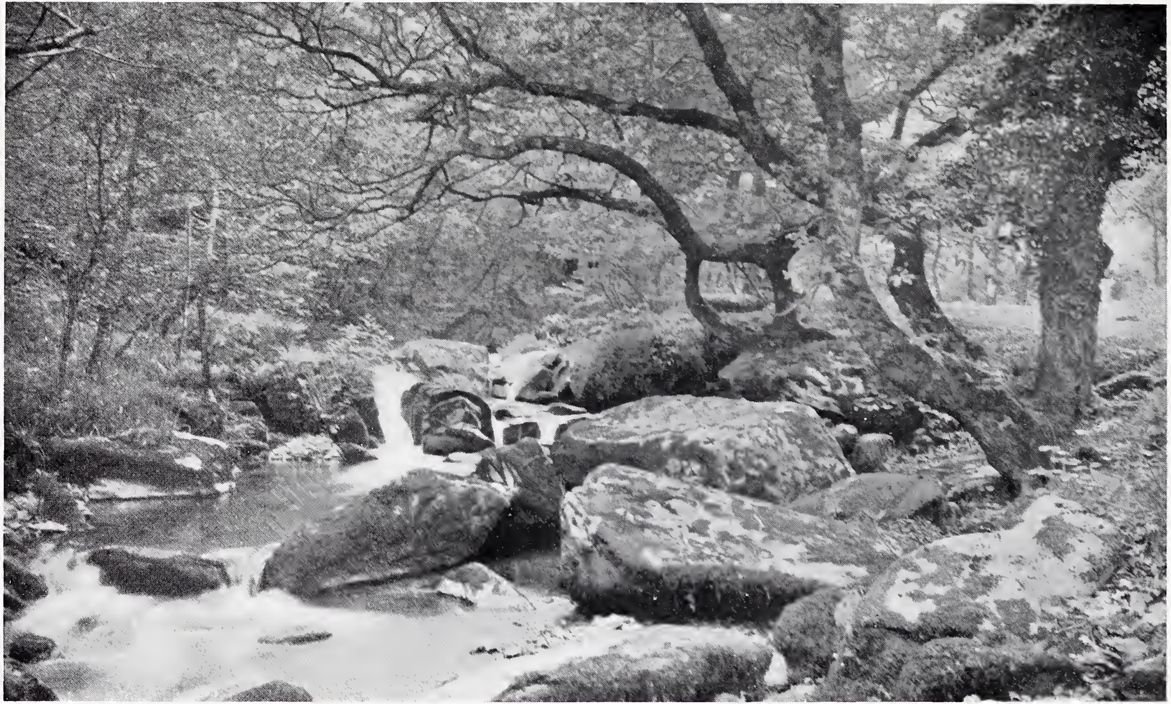

Fig. 9. John A. Hodges.

CORRECT EXPOSURE

a yellow stain if used with too great a proportion of alkali (accelerator), or if under-exposed prints are allowed to remain too long in the solution.

SOLUTION 1.

Hydroquinone	2 drachms.
Sulphite of soda	2 ounces.
Citric acid	20 grains.
Bromide of potassium	30 ,,
Distilled water	20 ounces.

SOLUTION 2.

Carbonate of potash	1 ounce.
Distilled water	20 ounces.

For use take equal parts.

Metol-Hydroquinone. Metol is also a good developer for bromide work, but, being somewhat quick in action, is not so amenable to control as some others. It works best with hydroquinone, and the following is an excellent formula:—

No. 1.

Hydroquinone	50 grains.
Metol	30 ,,
Sulphite of soda	1 ounce.
Bromide of potassium	40 grains.
Distilled water	20 ounces.

No. 2.

Carbonate of potash	1 ounce.
Distilled water	20 ounces.

For use mix in equal parts.

It is sometimes advised to mix the whole of the ingredients of the developer in one solution for the sake of convenience, but in practice it will be found better to keep the accelerator separate from the developer proper. Not only do the solutions keep better when separate, but it is more easy to modify the strength of the developer to suit special circumstances.

Amidol. Amidol we consider to be one of the best developers for bromide paper. It is clean-working, expeditious, and produces prints of a beautiful engraving black colour. Its adoption is strongly recommended. Its only disadvantage is that it does not keep well in solution, a satisfactory preservative not yet having been discovered. To overcome this difficulty either a stock solution of sulphite of soda may be made up and the requisite quantity of dry amidol added just before use; or the developer may be made up in small quantities as required. In cool weather it will keep for a fortnight or so in good condition, but oxidation sets in more rapidly when the temperature is high.

Sulphite of soda	600 grains.
Bromide of potassium	10 ,,
Citric acid	10 ,,
Amidol	60 ,,
Distilled water	20 ounces.

If the amidol is omitted, it is added to the stock solution just prior to use in the proportion of three grains to the ounce, care being taken to stir well, so as to thoroughly dissolve the amidol before applying the developer to the paper. Neglect of this precaution will result in the production of spotty prints, the amidol not being easily soluble. The characteristic feature of amidol is the speed with which the image appears; the beginner, however, should not be misled by this circumstance, for it is not an indication of over-exposure, and sufficient time must be allowed for the print to obtain full density.

Ortol. Among the more recently introduced developers ortol takes front rank as a developing agent for bromide paper. Unlike amidol it is slow-acting, and time must be allowed for the image to appear and gain in strength. It keeps fairly well in solution, and although the stock solution becomes slightly discoloured after a time, it does not stain the paper. With a normal exposure a very fine black is obtainable, whilst by increasing the timing and modifying the developer fine warm tones may easily be secured. The formula stands as follows:—

No. 1.

Ortol	½ ounce.
Meta-bisulphite of soda	150 grains.
Water	20 ounces.

No. 2.

Carbonate of potash	1 ounce.
Water	20 ounces.

Rodinal. Rodinal is obtainable commercially in the form of a concentrated solution, merely requiring the addition of water to make it ready for use. Convenience and simplicity,

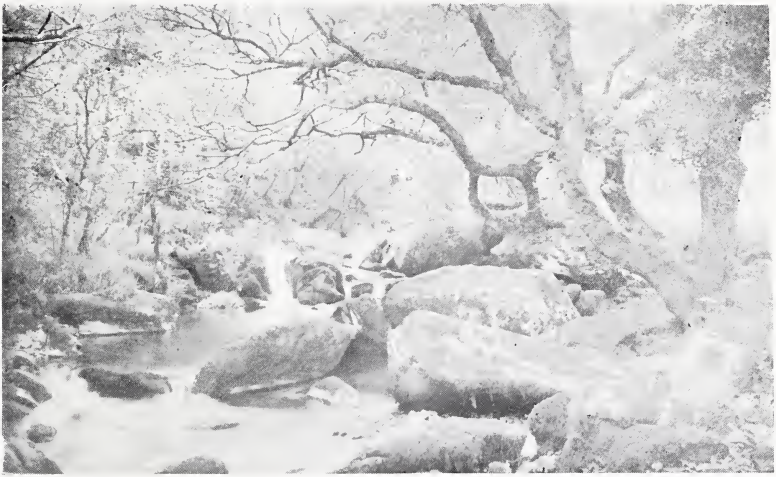

Fig. 10. J. A. Hodges.

UNDER-DEVELOPMENT.

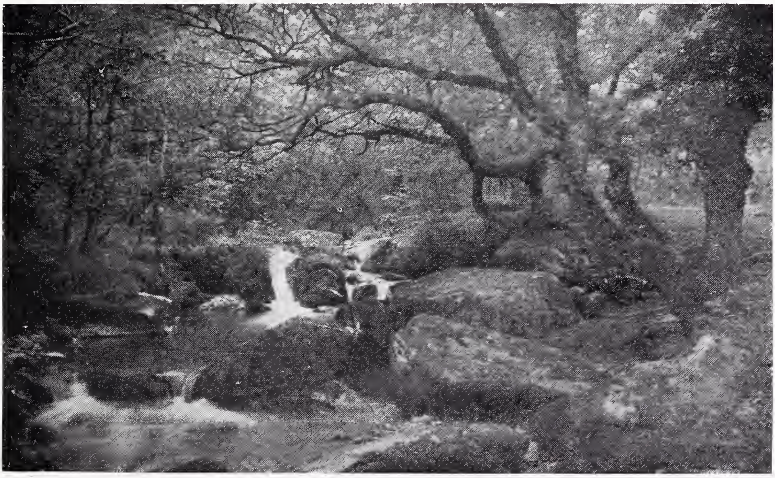

Fig. 11. J. A. Hodges.

OVER-DEVELOPMENT.

however, are not its sole recommendations, or it would not find a place here, for it is an excellent developer for bromide work, giving a pure and slightly warm black and being very clean in working. The following is a good strength to adopt under normal conditions:—

Rodinal stock solution	20 minims.
Bromide solution (10%)	3 ,,
Water	3 ounces.

Any of the formulæ given will, if properly used, permit of equally good results being obtained, and the novice in bromide printing is again advised to select *one* of these given, and work with it until good prints can be easily and uniformly produced, many early failures being due to a lack of knowledge of the characteristics of a particular developer —knowledge which only a prolonged user will impart.

In the following instructions it will be assumed that amidol is employed, it being the writer's favourite developer for bromide paper. The table having been arranged with the various dishes, etc., the dark-room lamp lighted, and the exposure made, the light is turned down and the exposed paper removed from the frame. It must not be placed dry in the bottom of a dish and the developer poured over it, for such a proceeding might result in stains and uneven development. The proper procedure is to fill a clean porcelain dish with water and immerse the paper in it bodily film side down, drawing it slowly against the side of the dish, subsequently turning it over face upwards, and allowing it to remain in the water until thoroughly limp. This treatment avoids the formation of air-bells, which would cause white spots in the prints. The water is poured off, and the previously mixed developer applied by pouring it on to the exposed paper from one corner, the dish being slightly tilted so that the solution may go over the entire surface of the paper in an even wave. The dish should be gently rocked as development proceeds to maintain a uniform action of the developer. It is a peculiarity of amidol that the image appears almost simultaneously with the application of the developer; but this must not be regarded as an indication of over-exposure, and the print must be developed until it is just a trifle darker than it is desired to appear when finished. Two points in this connection must be remembered: Bromide prints always dry slightly darker, and they also lose a little density and detail in the fixing bath. The result will largely depend on the correct estimation of the exposure, and a careful reference to and study of the illustrations accompanying this article will prove more helpful than many pages of written advice.

Tentative Development. A brief exospure followed by a strong development will tend to produce hard black prints, whilst the converse conditions, *i.e.*, generous exposure and a diluted developer, will result in grey-toned and softer pictures. Personally we prefer the latter mode of working, the ultimate character of the print being then far more under control; it is the method we have consistently followed and invariably advocated for many years, and those who have been induced to give it a trial have always expressed themselves pleased with the results. As a rough guide for these modified conditions, for it is obvious that precise quantities and times cannot be given, the normal exposure may be doubled and the developer diluted with an equal bulk of water. Working in this way the image will be longer in making its initial appearance, and will gain strength and detail slowly, development usually taking from ten to twenty minutes. Although special reference has been made to amidol in connection with this modified system, it is equally applicable to any of the other developers.

With any of the developers named, with the exception of ferrous-oxalate, the use of a clearing bath is unnecessary, a slight rinse in one or two changes of water being all that is required.

Fixing. The prints after rinsing must be fixed, and the fixation of a bromide print is a matter demanding more attention and care than is usually accorded to it. The chief causes of impermanence are (1) imperfect fixation and (2) insufficient washing after fixing. If these two operations are *properly* carried out, there is no reason to apprehend any lack of permanence.

An acid fixing bath is often recommended, but our own investigations and resultant experience lead us to the conclusion that a plain solution of hyposulphite of soda is preferable—less likely to produce complicated reactions, and therefore more conducive to permanence. The following strength is recommended; the solution should be freshly mixed, and not used more than once:—

Hyposulphite of soda	4 ounces.
Water	20 ,,

Limits in Development. It is useless to attempt to treat bromide paper in the same way as a negative; as, for example, adding accelerator to the developer to coax out detail from an under-exposed print. Such procedure will only result in harsh, crude prints. The proper course is to make a second exposure, the duration of which may be gauged with approximate accuracy by the appearance and behaviour of the under-exposed print. On the other hand, over-exposure may to some extent be corrected if it has not been unduly excessive by immediately adding a strong dose of bromide, and diluting the developer with an equal bulk of water. Usually a print produced under such conditions will lack vigour and present a flat and foggy appearance; if, however, it is known before applying the developer that the print has received an excessive exposure, the tentative system of development already described may be adopted with good results.

Temperature. The temperature of the solutions is an important factor in development, and in order to secure uniformity it is desirable to work at a constant known temperature—65° to 70° will be found convenient. Some developers, notably hydroquinone, lose much of their developing power if the temperature falls below 60°. As this fact is the cause of many failures and disappointments in bromide work, the employment of a thermometer is strongly advised, with the addition of hot water to the developer to bring it up to the required temperature.

Colour of the Image. The system of development described should result in the production of prints of a good engraving black colour, indistinguishable in fact from platinotypes, which may justly be taken as a standard of perfection. But it is sometimes desirable to obtain a warmer colour, and this may be effected either by a modification of the developer or by the subsequent operation of toning.

If it is desired to produce a warm tone by development, the ortol developer will be found suitable. Mix the developer as follows:—Stock solution of ortol made as previously described, ¼ ounce; carbonate of soda solution, ½ ounce; 10% bromide, 30 minims; water, 4 ounces. Give a generous exposure—*e.g.*, twice the normal. The development will be slow. If the image appears rapidly, the exposure has been too great; the print should be at least ten minutes in acquiring full density and detail.

Uranium Toning. The alternative method of producing a warm-coloured image in bromide of silver is by toning. Toning with uranium is one of the methods most in vogue.

In the first place, it must be noted that when a print is toned with uranium its density is considerably increased, the solution acting as an intensifier as well as a toner. Allowance must therefore be made in development for this subsequent increase in density, and this is best effected by giving a generous exposure—25°/₀ to 50°/₀ in excess of the normal—and developing with a developer that has been diluted with an equal bulk of water. Development under these conditions will be slow, and the print when fixed should show *full shadow detail*, but be lacking in vigour, *i.e.*, look flat and poor. Its colour is a matter of minor importance—in fact, if the image appear of a brownish black colour it will probably tone better than if it were a pure pearly grey.

It may be pointed out that the weak point of the uranium toning process is its want of permanency, therefore it is of the utmost importance to avoid as far as possible the conditions which tend to produce that result. If the least trace of hypo be allowed to remain in the prints, not only will their permanence be endangered, but one of the ingredients of the toning solution, the ferricyanide of potassium, will, in conjunction with the hypo, act as a reducer and destroy the fine details of the image. The prints therefore should be fixed for ten minutes in the ordinary fixing bath, and then *thoroughly* washed in running water until all the hypo is eliminated.

The toning bath is composed of two solutions, which keep indefinitely and are mixed in equal proportions just prior to use. The mixed solutions do not keep, and must be used as soon as prepared.

No. 1.

Uranium nitrate	50 grains.
Acetic acid (glacial)	1 ounce.
Distilled water	20 ounces.

No. 2.

Potassium ferricyanide	50 grains.
Acetic acid (glacial)	1 ounce.
Distilled water	20 ounces.

The prints may be toned directly they are taken from the last washing water, or they may be first allowed to dry; some workers consider that the toning action proceeds more evenly under the latter conditions, but in that case the dry prints should be soaked in clean water until they are evenly wetted, before applying the toning solution. The prints should be toned singly, each print being placed in the bottom of a clean porcelain dish, and a small quantity of the toning solution poured over in an even wave, sufficient to cover the print being all that is necessary. The solution must be kept in gentle motion flowing backwards and forwards over the print, which will soon change colour, going from warm black to various shades of brown, then becoming reddish, until finally a colour approximating to Bartolozzi red is produced. If the action is so rapid as to be beyond control the toning bath requires further dilution, some brands of paper toning with greater rapidity than others. When the desired colour is attained the prints are immediately transferred to a dish of acid water, which must be frequently changed, the washing being continued until the yellow colour disappears from the whites. The acid water bath is prepared by adding 20 to 30 drops of glacial acetic acid to a pint of water. If the washing is prolonged in plain tap water, which is generally alkaline, the toning effect will slowly dissolve out and ultimately disappear. In this way the final result is well under control, although this fact is in itself a testimony to the instability of the process. If the toned prints are washed in *running* water, the colour may be discharged locally and the prints thereby spoiled.

Uranium-toned bromide prints should be framed and glazed without unnecessary delay to protect them as far as possible from atmospheric influences, which may quickly cause deterioration.

Hypo and Alum Toning. The second method of producing a warm-coloured image is by toning with what is known as the hypo and alum bath. The results are more permanent than those produced by uranium, but the tones are not obtained with such certainty and ease, the process not appearing to suit all makes of bromide paper equally well.

The toning bath is prepared by making up in bulk a solution of hypo by dissolving 10 ounces of the salt in 70 ounces of hot water, using for the purpose an old iron saucepan. To this solution one ounce of alum is added with constant stirring; during this operation a strong smell of sulphuretted hydrogen is evolved, therefore it is advisable to prepare the bath out of doors. When the mixing is complete the saucepan must be put on the stove and brought to the boil. Sufficient solution should be prepared to fill a large deep dish, and it will be found to work best after having been used several times. It may be used at once, but the best plan is to allow it to first get cold. Toning is very slow in the cold solution, and it is usually used hot, and as the easiest plan is to heat the dish in which the toning is performed, a large, deep enamelled iron dish should be procured, a gas or oil stove being a convenient method of applying heat. The developed prints should have been allowed to dry as they do not tone so readily if put direct from the washing water into the toning bath. It is not necessary to give more than a superficial washing after fixing, as the toning bath itself contains hypo, but too long an interval must not be allowed to elapse between toning and fixing, or the traces of hypo remaining in the prints may have an injurious effect upon the image. It is desirable to completely immerse the prints in the tray of cold solution, and allow them to soak for half-an-hour before applying heat The alum has a hardening effect upon the film and enables it to withstand a higher temperature. The cold solution will have little or no toning action, and after the lapse of the specified time, heat should be cautiously applied and the temperature slowly raised to about 120°, the prints being turned over and over from time to time to prevent uneven action. A thermometer should be used to test the temperature and prevent the solution being made too hot. After a time, which varies with the character of the print, and the make of paper employed, the colour will slowly change from black to a brownish sepia. When the desired tint is obtained the toning bath should be poured back into its stock bottle, or jar, and the prints thoroughly washed in running water for at least an hour. A powdery deposit will probably be observed on the face of the prints and this should be carefully removed with a soft sponge or flat camel-hair brush before the washing is commenced. The prints will lose slightly in density, and therefore should be developed a little darker than they are required to appear when finished.

Platinum Toning.

The third, and in the opinion of the writer, by far the most satisfactory method of obtaining warm-coloured bromide prints is the mercuric-platinum method of Mr. Summerville. Moreover the colours obtainable more nearly approximate to sepia than those produced by any other method, and for this reason it is one that should commend itself to pictorial workers. It may be noted that the Platinotype Co.'s intensifier, as originally issued, consisted of mercury and platinum, and the writer used it with gratifying results so far back as 1890 for the toning of bromide prints, which up to the present show no signs of deterioration. At a later date the composition of this intensifier would seem to have been altered, for in its present form it does not appear to be so suitable for toning purposes *simplicter.*

Developing and Toning Bromide Prints.

By C. WINTHROPE SOMERVILLE, F.R.P.S.

THE fact that the visible result from exposure to light is dependent on development, constitutes the one feature which has prevented the bromide process from attaining a popularity far greater and more deserving than any other. That it should be so is somewhat inexplicable when we consider that a similar result is produced in a precisely similar manner in the making of a negative.

The difficulties put forth by the majority of those who have been unsuccessful with the process are so unreal, so lacking in reasonable consideration, one can but conclude that such workers never developed the negatives they tried to print from. If workers would only consider the production of the image on bromide paper in the same light as the printing of P.O.P., where the image in silver is reduced by light instead of a chemical, and by producing it slowly with the same amount of care, thought and attention, thereby controlling it to the desired end, there would be fewer disappointments and finer work.

As in all other printing processes the exposure is of the first and highest importance. Everything depends upon it. It is, however, of the next importance that development be manipulated in conjunction with it. Development *may* be applied independently of exposure, but the best results are not obtained by so doing. Before proceeding with the details of the process of development I wish to make clear one important fact.

Such an exposure may be given to bromide paper through a negative that with the application of a normal developer the image will be developed to a fixed and limited degree, so that however long the print is subjected to the developer no further reduction of silver will take place; any change in the emulsion after this degree has been reached will consist of chemical fog. Such an exposure is technically known as 'correct.'

It does not, however, follow that correct exposure always gives the best result pictorially. Far from it. For this purpose we can manipulate both exposure and development for almost any desired effect.

As before stated, exposure and development should be worked in conjunction with each other. There are three methods of accomplishing this. 1. Correct exposure and controlled development. 2. Controlled or manipulated exposure and mechanical or independent development. 3. Exposure and development both controlled to a definite end.

Correct Exposure

Is very simply ascertained in the following way.

A strip of bromide paper is placed over the highest light (darkest spot on the negative image) in such a manner that it may be moved so as to give several exposures of increasing periods. This is developed right out with a developer of normal strength, two formulæ for which are given below. The same proceeding is gone through with the deepest shadow and middle or half tone.

We have now a series of exposures showing the tone values at the three important points in the whole scale of gradation.

Now, the principal features in the following method of dilute development are, the production of large work without fear of loss and waste of paper, and, the facility with which exposure and development may be manipulated to any desired end; the following facts should therefore be carefully considered.

I. Under-exposure.

Is slightly counteracted, and only successfully manipulated by prolonged immersion in a dilute developer, which must contain as little as possible of any restraining element, such as bromide of potassium. 2. Correct exposure may be developed right out to the fullest intensity by prolonged dilute development, but the developer should contain a small quantity of a restraining element. The whole scale of gradation will be visible when the image has attained but a very weak intensity (Fig. 12.)

Note.—The image at this stage is susceptible to comparatively heavy doses of a restrainer.

3. Over-exposure To the extent of 25% is easily controlled by prolonged immersion in a dilute developer containing a comparatively heavy dose of a restrainer; when only slight, almost the same intensity may be attained as with correct exposure.

The surest method of obtaining the most perfect technical result from the negative in use is to over-expose to the extent of about 5%, and develop with a dilute solution containing a few drops of bromide of potassium.

A normal developer is one that will develop an image which has received a 'correct' exposure right out without producing fog in the emulsion.

Dilution is made in direct ratio to the amount of control desired during development. That is to say, that if a normal developer is diluted to ten times its bulk, development may extend over a period of an hour, stopped by rinsing at any stage as often as desired, and manipulated in the way of local treatment. Also the speed of reduction may be increased by increasing the strength of the developer.

For very large work where a sufficiently large dish is not available the paper may be thoroughly soaked and supported on a smooth surface such as a drawing board, sheet of glass, or varnished wall, and developed and fixed by means of a sponge.

When an image is developed right out, reduction is in direct ratio to the amount of light received, therefore if local treatment be applied in the way of accentuating the intensity of any parts by touching them with a stronger solution of developer, development must not be carried to the limit, as the effect will be lost.

The influence of bromide of potassium is so powerful in bromide printing that careful study should be given to its action, and still greater control may be effected if subsequent toning of the print be contemplated.

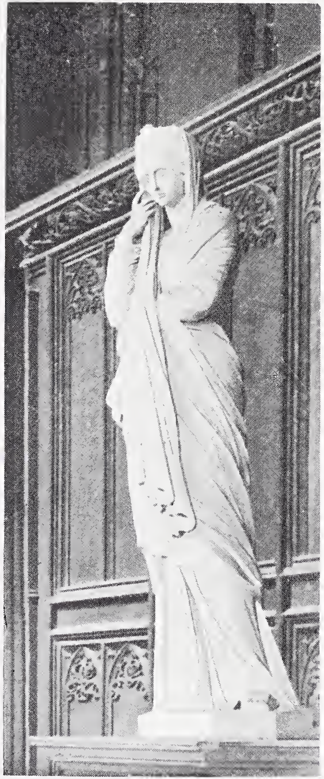

Fig. 12.

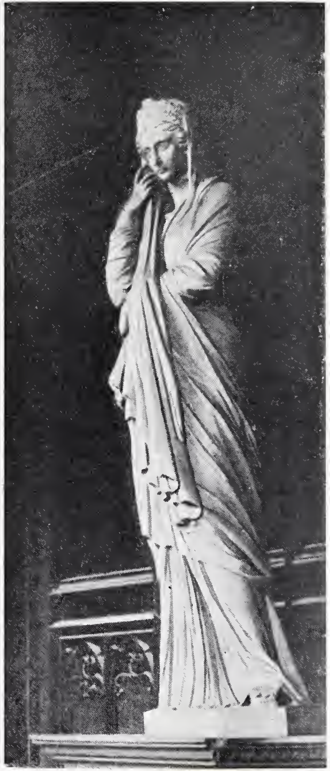

Fig. 13.

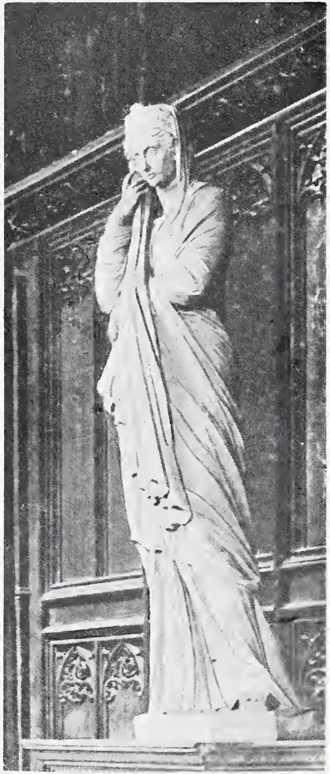

Fig. 14.

See note at the end of Mr. Somerville's article, page 27.

A developer heavily restrained is very liable to produce a tint several degrees from pure black, but when the silver is replaced, or has another metal deposited upon it, this peculiar tint need not be considered, as the effect of the toning will be the same as if it were of a pure black colour.

On the other hand, if a perfect toning process be employed the *gradation* should be in precisely the same ratio, with the exception that the intensity of the shadow black will be raised to the tint peculiar to the process employed. Hence the necessity for adjusting developers *to* the contemplated toning process.

The two illustrations given are from a negative purposely chosen as being one which the majority would pronounce hopeless for bromide printing.

The statue is of brilliant white marble, and facing the light, stands out in great contrast to the rest of the architecture. In consequence, while the rest of the negative is thin and soft, this figure is comparatively a solid mass of deposited silver. To get anything like detail in the carved woodwork at the back, and the roof, both exposure and development were manipulated. Correct exposure was ascertained and doubled, and the developer heavily restrained, development being stopped long before the limit. This produced a print of a brownish tint which was afterwards slightly intensified and toned by the methods given below. The untoned illustration shows a print which has received precisely the same exposure and been developed to the limit in a developer containing a smaller proportion of the restrainer.

Intensification. The intensification of a bromide print always necessitates the combination of the silver with another metal, and if this be of less stability there is a risk of affecting the permanency of the print; if, on the other hand

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NOTE.—All three prints, 12, 13 and 14 received the same exposure. Fig. 12 shows the intensity to which the print may be developed by dilute developer and still sensitive to the influence of bromide of potassium. Fig. 13 shows the image developed right out. Fig. 14 shows the controlled print.

the second metal be of equal or greater stability, no such risk occurs.

Of late I have been perfecting a process on which I have carried out a considerable amount of research work extending over a few years, with the primary object of replacing the silver in a bromide print with platinum for the obtention of sepia tones. The result has been in a measure successful, and more than that, has brought to light some other possibilities with regard to the combination of platinum and silver, one being a method of intensification, the equal of which I have never yet seen.

Those who admire the blue black tone of the platinotype may secure it as follows:

Prepare a solution containing platinum.

Potassium chloroplatinite	2 grains.
Mercuric chloride (bichloride)	1 ,,
Citric acid	9 ,,
Water	1 ounce.

Add to this two minims of 10% bromide of potassium.

Immerse and rock the print in this till a slight brownish tint appears.

Wash in running water for five minutes, and apply any developer used for bromide work diluted to five times its normal strength.

Wash in running water for fifteen minutes.

Greater intensifiation may be obtained by carrying the tint further till a sepia tone is produced.

Toning. As in intensification, toning involves the superimposition or amalgamation of another metal; if also this be of greater stability than the silver the permanence is assured.

A fine sepia tone may be obtained by immersing the print in the platinum solution just given till the required tint is attained. The addition of bromide of potassium produces a slight instantaneous intensification, and also serves to preserve the print from stain; if it be omitted the tone is rather warmer, and a slight, but by no means unpleasant, staining of the emulsion occurs if toning be prolonged.

To those who care to try them the two following formulæ for developing bromides can be recommended.

RODINAL. NORMAL DEVELOPER.

Rodinal	10 to 15 minims.
Water	1 ounce.

10% bromide of potassium to be added as required usually from 3 to 10 drops per quantity of rodinal

METOL-HYDROQUINONE. NORMAL DEVELOPER.

Metol	100 grains	or	10 grammes.
Hydroquinone	30 ,,	,,	3 ,,
Sodium sulphite	3 ounces	,,	130 ,,
Potassium carbonate	1½ ,,	,,	66 ,,
Water	80 ,,	,,	3500 c.c.

10°/₀ bromide of potassium to be added as required.

How to take a Bromide Print from a Wet Negative.

IT is sometimes a convenience to quickly obtain a rough proof from a wet negative, *i.e.*, one that has been well washed but not yet set up to dry.

First soak the piece of bromide paper in a dish of clean cold water for a few minutes, *i.e.*, until the paper is quite soft and limp. (The dish may advisedly be covered during this soaking so as to reduce the risk of a foggy print). Then lay the sensitive side of the paper in contact with the wet film of the negative, taking care to avoid any air-bubbles between the negative and the paper. Next lay the bromide paper and negative on a sheet or two of blotting paper, supported by some *flat* surface, *e.g.*, the inside of a celluloid developing tray or slab of wood. Dry the face of the negative by laying over it a sheet of dry blotting paper. Then make the exposure, carefully remove the paper, and develop the print in the usual way.

A Method of Printing Tinted Borders round Bromide Prints.

By The Rev. F. C. LAMBERT, M.A.

THE method now to be described may appear to be complicated and difficult on reading the description. But the reader may be assured that in actual practice there is no difficulty whatever. The reader is invited to follow our description stage by stage, using an ordinary printing frame, an old negative, a piece of clear glass, and a sheet of note paper on one side whereof is written the words "film side," so as to represent a piece of bromide paper.

Let him go through the steps in a good light (day or gas) and he will at once see how simple the whole matter is.

By way of example, let us suppose that we are going to print from a quarter-plate negative, and use a half-plate size of paper. For this we need a half-plate ordinary printing frame. Select one which has a true right angle at one of its corners—preferably the right-hand upper corner. You can easily test the corner by fitting to it a new clean cut post-card. This done, mark the corner by sticking on the outside at the back of the frame a bit of gum paper (stamp edging) so that you may easily see this corner in the dark-room.

Now take a bit of stout card of about but not more than the thickness of the negative which is to be printed from. Cut this card to fit the half-plate printing frame (D, Fig. 30). From its centre cut out an opening just large enough to hold the

Fig. 15. F. C. Lambert.

BROMIDE PRINT WITH SINGLE-PRINTED BORDER.

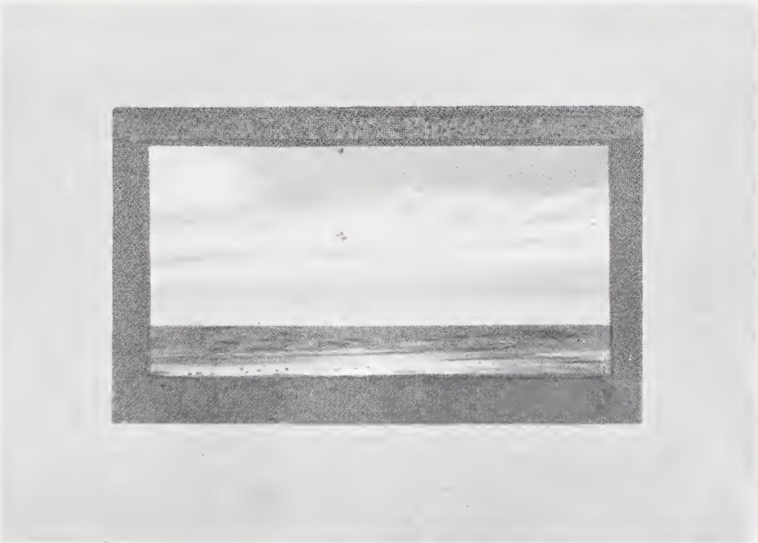

Fig. 16. F. C. Lambert.

BROMIDE PRINT WITH DOUBLE-PRINTED BORDER.

quarter-plate negative (N, fig. 30). In the half-plate frame put a piece of clear glass. On this, as support, goes your negative N and its holder D. (Of course we may, in place of N and D, use a half-plate negative, and in that case we require no clear glass support).

Now take two pieces of *thin* but stiff card. The thin straw board used as packing by several makers of bromide papers will serve very well. These should be cut so as to be the same size as the paper that is to be printed, viz., in our imaginary case, half-plate size. It is *most important* that each of these two cards should have a true right angle at one corner, corresponding with the selected and marked corner of the printing frame. These corners are marked with a bit of gum paper (see figs. 25 and 27), so that we may always be readily able to place these corners of our cards in the marked angle of the printing frame. We must next fix upon the size of picture that we are going to print from our quarter or half-plate negative, as the case may be. This size is now carefully drawn in the centre of one of our cards, with a hard fine-pointed pencil. This is neatly cut through with a sharp, fine-pointed knife; care being taken to cut so that the two parts have clean sharp edges.

Our first card is now in two parts, viz., fig. 25 A the larger part with opening in centre, and smaller part B, fig. 26. Next, our half-plate sized piece of clear glass is laid in the printing frame with its right-hand upper corner pressed close up into the marked corner. The piece A is laid on it—also with the marked corner pressed well up into its corner. Then the piece B is laid in the opening again, and by means of a dab of fish glue at each corner is fixed to the plate glass. When this is quite dry and fixed in position, we cut away a shaving all round the edge of B, so that when the loose card A is laid on the glass bearing B, we get the effect as shewn in fig. 29. The space between A and B should be about $\frac{1}{32}$ of an inch, or say as wide as a *small* sewing needle. Now take the second card C, fig. 27, and from its centre cut out an opening to correspond in size with the inner tint of the border which we are going to add to our print (see figs. 15 to 18).

Now let us make an imaginary print on our sheet of note paper.

Lay the printing frame face down. Put in the half-plate negative (or the quarter-plate, holder D, and clear glass), and push up close to the marked corner.

Put in the card mask A—pushing up the marked corner into its place.

Lay on the negative and mask A the film side of the paper, and on the back make a pencil mark in the right-hand top corner.

Imagine the exposure made. Now sketch the outline of the exposed part. Let us say this was exposed 10 seconds. Mark this part 10 seconds.

Remove your negative from the printing frame. Put in its place the clear glass bearing the central mask B, fig. 26. Put in your imaginary bromide paper, with the marked corner of course in its proper corner of the printing frame. Now imagine the margins of the paper to be exposed for, say, one second. Mark this part of the paper accordingly. If now we developed our print, we should have a picture with a uniform tinted margin (fig. 15). If we want to put a darker band round the picture we must give this band a little more exposure. This we can do by laying the card C on the clear glass bearing the central mask B, as shewn in fig. 28. We may now repeat the exposure for, say, one second. How do matters stand now? Our picture was exposed ten seconds, the outer margin one second, and the inner part two seconds. We shall now get the kind of effect shewn in fig. 16.

To put a light band round our picture, as in fig. 18, all we need is that our centre mask B, fig. 25, shall be a little larger than our border mask A, fig. 25.

Finally we may wish to put a *narrow* dark band or line round the picture. This we do in the same way by combining the masks A and B (see fig. 29 and fig. 17).

Thus we may ring the changes by using any number of masks we please, of any size we please.

The one thing which needs care is to see that the masks and the paper we are printing are always pushed up close into the same corner of the printing

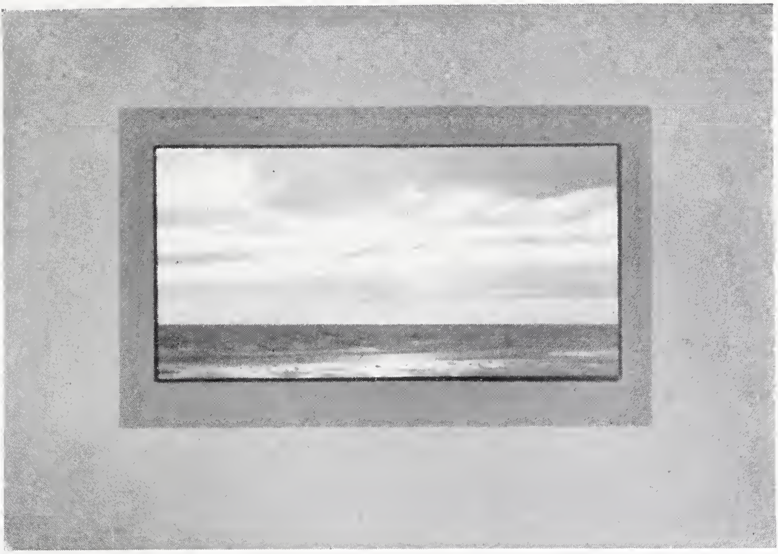

Fig. 17. F. C. Lambert.

BROMIDE PRINT WITH TRIPLE-PRINTED BORDER.

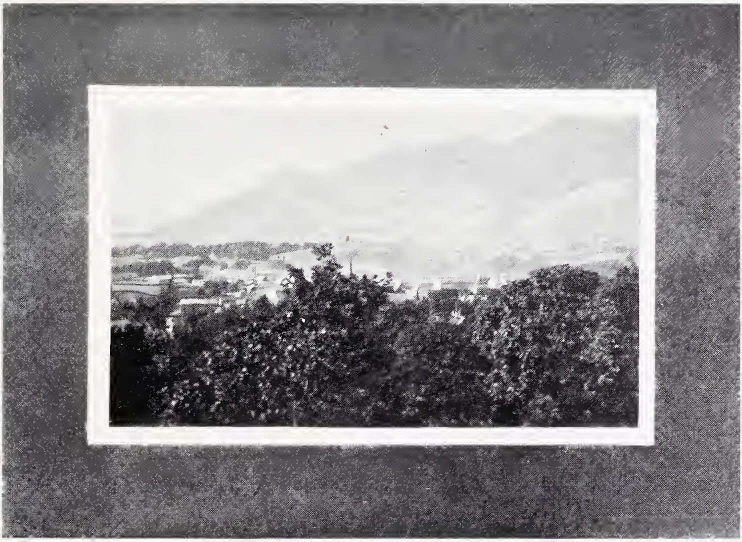

Fig. 18. F. C. Lambert.

BROMIDE PRINT WITH WHITE BAND AND PRINTED BORDER.

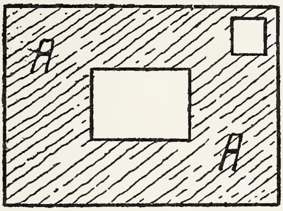

Fig: 25.

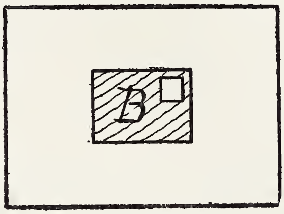

Fig: 26

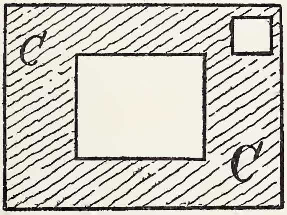

Fig: 27.

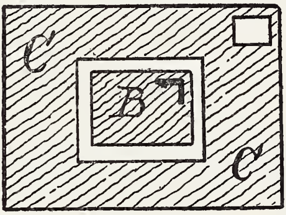

Fig: 28.

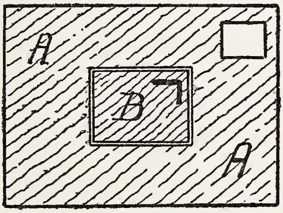

Fig: 29.

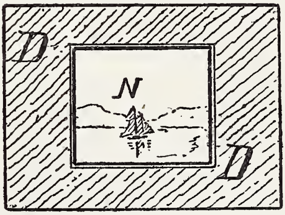

Fig: 30.

frame. By this means we get good register. This is the only point in this system which calls for any special mention. Of course it goes without saying almost that neatly cut masks will give neat edges, and carelessness in this, as in many other photographic operations, will reveal itself in the result.

To get better contact near the edges of the opening in the mask A, fig. 25, cut a bit of cloth of the same size of the opening in A, and lay this on the back of the paper before closing the printing frame, having previously rubbed the paper into close contact with the card mask.

The After-Treatment of Bromide Prints.

(Intensification, Reduction, Toning, etc.)

By CHAPMAN JONES, F.C.S., F.I.C., F.R.P.S.

IF the bromide print as washed after fixing is not satisfactory, it is generally better to make another rather than to try to doctor up the faulty production. But there are exceptions to this rule.

In those cases where nothing further than a general clean up is required and the getting rid of perhaps a few fine dark lines that have been fitly compared to pencil marks, it is only necessary to see that the print is quite dry, to dip a little pad of cotton wool into methylated spirit, squeeze it to get rid of the superfluous liquid, and holding it between the fingers to gently rub the surface of the print, giving special attention to those parts that need it. It is astonishing what an improvement this treatment will sometimes effect, but it must be remembered that the rubbing tends to, and often does, remove the extreme surface of the gelatine, and that it tends at first to polish the surface and if too roughly done to cause a visible abrasion. It has a reducing effect, but is not suitable for effecting an appreciable amount of reduction.

If it is desired to alter the colour of the print, there are several methods by which this may be done, as subsequently shown, but if the fault is a general error of gradation, the blacks inky and the detail in the lights too feeble, or the whole image flat, gray and foggy, then it is generally useless to spend further time on the print. Granting that the negative is of fair quality, then inky blacks and chalky lights may be obviated by increasing the exposure and diluting the developer, and often it will be found that multiplying the time and the dilution by the same figure, say two or four, will give a useful indication as to the extent of change that will give the desired result. If the image is flat and foggy, the exposure should be halved or quartered for the next attempt, and the developer made rather stronger, if possible. But such a small change in either direction as will improve a print that is already good may be obtained by several of the methods given subsequently.

A bromide print as washed, after fixing, consists of an image in metallic silver held in its place by a thin film of gelatine. If properly fixed and thoroughly washed, such a print will be more likely to remain unchanged than probably any other kind of silver print, when exposed to the ordinary conditions of light and atmosphere. No silver print can be permanent in the sense that a platinum print is permanent, but on the other hand no one can set a limit to its life. It is chiefly, if not entirely, a question of environment. But when a bromide print is treated with any of the reagents afterwards described in order to intensify it, or to alter the colour of the image, the simple constitution of the print is altered; it is no longer metallic silver in gelatine, but some compound of silver often with a compound of some other metal in addition, and obviously the more complex the image the more liable it is to suffer injury. Generally speaking, a silver compound is more readily attacked than the metal itself, and an image that consists of two different substances will be damaged by any circumstance that will affect either. This necessary multiplication of the possible points of attack in an image of a complex character is a strong argument in favour of simplicity.

Therefore speaking generally, the after-treatment of a bromide print tends to shorten its probable life. Whether it really will do so or not in any particular case cannot be definitely stated, because it depends upon the treatment that the print will receive. The case is somewhat analogous to the expectancy of life in human individuals. The complexity of image is an increased risk, but increasing the risk does not always lead to a shortening of the life, sometimes indeed it is the indirect cause of its extension. Then too the life of a print is not so sacred a matter as the life of a man, and one may wish to sacrifice the future for the present. Some more specific indications of the circumstances that are likely to prove disadvantageous, will be given in each particular case considered.

Reduction. A bromide print, chemically considered is exactly analogous to a negative. In general, therefore, the methods useful for reducing, or dissolving away a part of the image in the case of negatives are applicable also to prints. When metallic silver is exposed to the air in the presence of a substance that will dissolve silver oxide, it is the rule for the silver to combine with oxygen from the air and for the resulting oxide to dissolve. This accounts for the reduction of density when a print is left in the fixing bath for a few hours, and if a part of the print projects from the solution, a greater reduction may be expected where it cuts the surface of the liquid, as at that part the air has freer access to the print. Ammonia will behave like hypo, but these methods are not to be recommended because of the liability of the reagent to soften and disintegrate the gelatine during the long soaking. Potassium cyanide is more energetic and will do in a few minutes what the other reagents would require a few hours for. It was claimed for it many years ago that a very weak solution would reduce a toned albumen silver print without altering the colour of the print, and experiments appeared to show that the claim was justifiable. Potassium cyanide will reduce bromide prints, though it is not generally employed for this purpose. The reason for its neglect, if reduction has to be done, is not obvious, except that being specially poisonous it is often not available, and being strongly alkaline it softens the gelatine. If used, it is well to prepare a small quantity of a rather strong solution and add a drop or two of this to an ounce or so of water, increasing the quantity if the effect is too slow. It is not likely to cause stains nor to affect the permanency of the print if the subsequent washing is well done.

Instead of trusting to the oxygen of the air, it is more usual to add an oxidizer to the solution used, and this tends to evenness of action, as the active agent is equally diffused through the solution. A very clean and chemically simple method of work is to treat the print first to a solution of ferric chloride, which should be of something like a light sherry colour for strength, until the reduction of density is satisfactory, and after washing to fix the print again in hypo, and then well wash. The iron salt converts some of the silver into chloride, being itself reduced to ferrous chloride, as expressed chemically :—

$$Fe\,Cl_3 + Ag = Ag\,Cl + Fe\,Cl_2$$

The silver chloride being white is hardly visible, but it must of course be removed by a subsequent hypo bath, as it would change on exposure to light. In this case the iron salt cannot be mixed with the hypo, because they would speedily react together with the production of ferrous chloride and sulphate instead of thiosulphate of sodium, substances that would not affect the image. This action will show the necessity for thoroughly washing the print before reduction, for if any thiosulphate is not removed, it will reduce the ferric chloride in contact with the part of the print where it happens to be, and at that part the reduction of the image will be retarded or prevented. That is to say, the iron salt will act on the remaining hypo rather than on the metallic silver when they are presented to it together. This of course leads to an irregular reaction, and a reducing action that is once uneven will always remain so, for the reduction can never be complete or the image would totally disappear, and so the parts where the change is retarded never have a chance to catch up with the other parts. This risk of uneven action is less when a one-solution reducer containing hypo is used, as in the two methods following, but it is not absent even then unless the print is first soaked in the hypo solution alone until it is equally impregnated with it.

Although ferric chloride cannot be mixed with hypo without the ferric chloride soon being reduced and so rendered useless, there are other iron salts that will attack the silver far more quickly than the hypo, and these may be mixed with it before being applied to the print, and used as a one-solution reducer with the advantage that the action is complete as it proceeds. The two principal compounds that are used in this way are potassium ferricyanide (red prussiate of potash), and potassium ferric oxalate. In the case of the former, the print is first soaked in a clean solution of hypo which may conveniently be of half the usual strength, namely, two ounces to the pint. A crystal or two of the ferricyanide is washed two or three times with small quantities of water and until of a bright red colour, and then water sufficient to a little more than cover the salt is added and shaken gently to form a yellow solution. This is poured off from the residue into another glass, the hypo solution from the print is added, and the mixture reapplied to the print. If the action is too slow, more ferricyanide solution is added in the same manner. Unless the solution is yellow from the presence of ferricyanide it is not active. If it turns blue it should be rejected at once. The ferricyanide and hypo must be mixed immediately before use, as stated, because they react together somewhat after the manner of ferric chloride and hypo, though much more slowly.

Potassium ferric oxalate reacts still more slowly with hypo, so that the solution may be prepared and kept for some time, but it must be kept in the dark. This reducer is commonly known at "Belitzki's," and his formula was to take from 5 to 10 parts of the green double salt that often crystallizes out from old (and oxidized) ferrous oxalate developers, and dissolve it in 100 parts of the ordinary hypo solution. This formula has been modified in many ways, chiefly perhaps, because of the difficulty of obtaining the potassium ferric oxalate. Eder recommends

Ferric chloride, 1 part in 8 parts of water.
Potassium oxalate, 2 parts in 8 parts of water.

Equal parts of these two solutions to be mixed when wanted, and the resulting solution added to from an equal bulk up to three times its bulk of the usual hypo solution. An acid solution has found much favour and in its turn has been much modified. The following version of it is due to O. Jarecki.

Water	7 fluid ounces.
Sol. of ferric chloride	2 fluid drams.
Potassium oxalate	180 grains.
Sodium sulphite (crystallized)	120 ,,
Oxalic acid ... about	35 ,,
Sodium hyposulphite	1¾ ounces (avoir.)

The ferric chloride solution is the "liquor ferri perchloridi fort" of the pharmacopœia and contains about 37·8 per cent. of the dry salt. It is obtainable from any druggist. This added to the water gives a yellow solution, the oxalate is then added after powdering it, and gives a green solution, the sulphite is then dissolved and turns the solution back to a ruby red, then the powdered oxalate acid is added little by little until the green colour is restored. Finally the hypo is dissolved and the solution filtered. The solution smells of sulphurous acid and should be kept in the dark. The advantages of such reducers, as compared with the ferricyanide and hypo, are their greater permanency and less liability to stain.

The reducers, already mentioned, have a tendency which is often very marked, particularly when they work quickly, of producing a greater proportionate effect in the thin detail of the image, "eating out the high-lights," than in the denser parts. This may be an advantage if the print is not only too dense but too flat, as it tends to clear away fog in the lights, but it is disastrous if the print is already too hard, as from under-exposure in either the negative or the print. In this last case the reducer should be made dilute so that it may act slowly and penetrate the film as thoroughly as possible before it produces any appreciable effect. But this tendency is entirely obviated by the use of a persulphate.

Ammonium persulphate is preferable to the potassium salt because of its far greater solubility in water. This acts alone, that is, without the presence of hypo, thus:—

$$2Ag + K_2S_2O_8 = K_2SO_4 + Ag_2SO_4$$

But this is not the only action. The odour of ozone may often be noticed and the solution becomes acid. The practical result of the action is that the dense portions of the image are very notably thinned down, while the thinner parts may be scarcely affected so far as the appearance indicates. Obviously this is sometimes a very useful change, but the drawback to it is that the reason for the abnormal behaviour of this reducer is not understood, and consequently no one knows what the resulting image consists of. Under the more usual circumstances, ammonium persulphate will be found a very valuable reagent. The print must be washed until quite free from hypo, otherwise the action will be uneven, because wherever any hypo remains the persulphate will be reduced in amount or altogether destroyed. Simply dissolve about 10 grains to the ounce, more may be taken in obstinate cases and it is safer sometimes to start with a weaker solution, and soak the print in it with suitable rocking until the desired effect is obtained. If simple washing is to follow, it should commence just before the reduction is sufficient, as the action will not stop at once, but it is safer to plunge the print into a weak, say 20 to 30 grains to the ounce, solution of sodium sulphite. This immediately stops the action and has the further advantage of more certainly removing the silver sulphate which is not readily soluble in water, and moreover might probably be partly precipitated on the print as chloride if ordinary town water was used. A print so contaminated would of course change notably on exposure to light.

Toning and Intensification. The intensification of bromide prints is rarely needed and is not always easy to effect without simultaneously producing a change in colour. It is impossible to argue that because a negative may be intensified by a certain process with the production of an image of a certain colour, that therefore a bromide print will suffer a similar change by the same treatment. The difference is probably due to a difference in size of the particles. For example, one intensification process that gives a black image in the case of negatives, may give a full red image with a lantern slide, while another will give a very warm black, almost a brown when applied to a bromide print. In the writer's experience the tendency is always towards redness or warmth when the print gives a different result from the negative by the same process.

For simple intensification, when a change of colour is not wanted, the print may be bleached in the ordinary solution of mercuric chloride (a saturated solution containing two drops of strong hydrochloric acid to each ounce) well washed, and then treated with ferrous oxalate (one part by measure of a saturated solution of ferrous sulphate added to six parts by measure of a saturated solution of potassium oxalate). This well-known method of intensification results in the addition of one atom of mercury to every atom of silver present in the image. Instead of ferrous oxalate an alkaline developer may be used, but there is no need to add any restrainer. The alkaline developer is not generally to be recommended because it will remove a considerable proportion of the mercury, but if used a full dose of sulphite should be present to prevent staining. Many other reagents may be used to follow the mercury solution. Sodium sulphite or thiosulphate will give a less effect than ferrous oxalate. Ammonia will give a warm-coloured image, but it cannot be recommended because of its very uncertain permanency, it appears to be far more liable to change in a print even than in a negative, and not merely because the amount of material that goes to make up the image is so very much less in the print. To use any of these methods with an approach to success the print must be well washed to begin with to free it from hypo and well washed after the bleaching, and, of course, well washed finally.

The effects of reduction and intensification, as so far considered, can almost always be obtained by a better adjusted exposure and development, any difference being as a rule in favour of the new print as compared with the doctored print.

Toning.

But if it is desired to alter the colour of the image the case is different, and although a certain difference of colour can be obtained, for example, by giving more exposure and adding bromide to the developer, such procedure generally inclines towards giving a disagreeable greenish hue and is rarely serviceable. Many of the methods about to be described have been often employed, and it is claimed, at least for some of them, that they make no practical difference in the life of the print.

The hypo and alum toning bath has been much appreciated and often recommended. It changes the black or grey image to a sepia colour. The print should be made rather darker to allow for a slight reduction in density. The solution is prepared by heating to boiling 70 ounces of water (3½ pints, though of course smaller quantities may be taken, if desired) and adding to it 10 ounces of hypo. When this is dissolved add gradually one ounce of alum a little at a time. The liquid will be milky white, but should not be filtered. It improves with age somewhat, and may be reinforced, when necessary, by adding a little freshly prepared solution. An entirely new bath reduces the density of the prints rather more than an old bath. If used cold, the bath will require a long time, some hours, to produce the colour required, but if used hot, the change will take place in a few minutes. The limit of temperature is fixed by the resisting power of the print, and it is generally necessary to treat the print after fixing to an alum bath to harden the gelatine somewhat before it is toned. Some workers recommend a temperature of 110° to 120° Fahr. requiring thirty to forty minutes treatment, but others have suggested 150° Fahr. and about thirty minutes. Shorter times will give a less change, about a third of the period advised giving a warm black rather than a sepia. After toning, the print may be treated to a simple alum bath, in any case it should be well washed. The action of this toning bath appears to be probably due either to a partial change of the silver of the image into sulphide or to a deposition of sulphur upon it, or perhaps to both changes combined.

There is a class of toning baths available that depend upon the same chemical change, namely, the reduction by means of the silver of the image of the ferricyanide of a metal to a ferrocyanide; the ferricyanide chosen being one that is soluble in water or in some convenient solution, while the ferrocyanide is insoluble, and consequently when produced is deposited as a solid pigment. In this case the silver is itself changed into either a ferro or ferricyanide and forms a part of the image unless it is dissolved out. The action is illustrated by the equation:—

$$4\ Ag + 4\ Fe\ (Fe\ Cy_6) = Fe_4\ (Fe\ Cy_6)_3 + Ag_4\ (Fe\ Cy_6)$$

Or by changing the 4 Ag on each side into 3, the production of silver ferricyanide is shown instead of ferrocyanide. But there are other possible and probable changes of the same type. The iron salt on the left-hand side of the equation is ferric ferricyanide, which is soluble in water, while that on the right-hand side is a dark blue (Prussian blue) insoluble compound, ferric ferrocyanide.

The most important of these kinds of toning baths for bromide prints are made with salts of uranium, copper, or iron. Uranium and copper give red colours of a brownish hue, the copper, perhaps, a rather browner, heavier looking, denser red than uranium, while iron gives a blue. These colours may be modified to a certain extent by after-treatment; or, for example, a mixture of iron and uranium, either in the same solution or by treating the print with an iron solution after it has been toned in the uranium bath, may be used.

The uranium bath may be prepared by dissolving from one to two grains of uranium nitrate (or acetate) with half its weight of potassium ferricyanide, adding from five to twenty minims of glacial acetic acid to each ounce of water. If the ferricyanide is not clean, it is likely to give a brownish precipitate when added to the uranium solution; this must be filtered off. The acetic acid is necessary, because the image toned with uranium is very easily attacked by alkalies, even ordinary hard water will gradually remove the added colour. The smaller amount of acid will generally be found sufficient. For stock solutions it is well to keep the uranium and acetic acid ready for use, adding the ferricyanide when required. The well-washed print is placed in the solution, and gentle rocking maintained, as the cold black of the image gradually brightens up to a warm black, then changing through reddish brown or sepia to finally a full red. When the desired colour is obtained the print is removed and washed, but the washing water should be slightly acidified (two or three drops of acetic acid to the ounce) for the reason already given. To get a still purer red that is further removed from the brownish tint, the fully-toned print may be treated with hypo to remove as much silver as possible, again avoiding any alkalinity. The toned print should wash clean readily if care has been taken, but if it appears at all fogged it may be treated with a *very* slightly alkaline bath (ammonia or ammoium carbonate) for a short time, or merely washed in unacidified water for a longer time. Either treatment will remove some of the pigment and reduce (in a photographic sense) the toned print.

Ferrocyanide of copper is of a brownish red colour, very similar to the uranium compound, but the ferricyanide is a yellowish green substance also insoluble in water. There are several substances, which give aqueous solutions that will dissolve the ferricyanide and not the ferrocyanide of copper, but none hitherto tried are satisfactory, chiefly by reason of staining, except alkaline citrates, such as potassium citrate. This salt was introduced for the purpose by Mr. Ferguson. Taking ten per cent. solutions of each, 75 parts by bulk of the copper solution may be added to 570 parts by bulk of the potassium citrate solution, and then 66 parts by bulk of the ferricyanide are added slowly with agitation. All trouble in making the solution may be avoided by the use of the "tabloid" preparation, one tabloid being dissolved in each ounce of water. The colours produced are very similar to those that uranium gives, but much less sensitive to alkalies, so that no special precaution has to be observed. As with uranium, the red colour may be made of a less brownish hue by treating the toned print with hypo solution of the ordinary strength. And here may be emphasized the absolute necessity of getting rid of all hypo from the prints before toning them by any method of the type under consideration. Any hypo remaining will reduce the ferricyanide and give a coloured deposit, which, of course, cannot be removed without injury to the image. A thorough washing must precede the toning.

TONING BATH FOR BLUE COLOURS.

Water	10 ounces.
Potassium ferricyanide	40 grains.
Acetic acid	2 drams.
Ammonia-citrate of iron	20 grains.

This bath is similar in its general character to those already given. The blue image resembles the red image obtained by copper in being attacked by alkalies, and also in not requiring (as the uranium toned image does) any *special* precautions with regard to this matter.

In the case of bromide prints toning with gold or platinum is rarely resorted to, because the object of toning with these metals is generally to counteract the redness of silver prints, and bromide prints are grey or black as prepared, the toning of them generally being for the purpose of getting a warmer colour. But if a bromide print is of a disagreeable greenish or rusty colour when a full black is desired, then these processes are serviceable. It should be borne in mind that the deposit of gold may be either red or blue. A slow action gives a reddish colour and will therefore not improve the print, indeed a considerable action may take place, much gold being deposited, but without an appreciable change of colour. In such a case the merely practical man says that the toning bath does not work. It is the blue deposit of gold that is wanted, giving a cold blue-black colour, and if the toning is carried too far the blue will be too pronounced. Platinum gives a grey deposit and is therein different from gold.

As to formulæ, the well-known sulphocyanide bath is generally recommended for gold, 20 grains of ammonium sulphocyanide in one ounce of water to which is added, with stirring, 2 or 3 grains of gold chloride dissolved in another ounce of water, shortly before use. For platinum, 2 or 3 grains of the red potassium platinous chloride (or chloroplatinite) may be dissolved to each ounce, adding a drop or two of nitric acid to ensure that the solution is acid. Bromide prints toned by these formulæ contain chloride of silver, and, although the ordinary process takes no note of this fact, it seems that it would be better to remove it if unalterableness of the print is valued, by a second fixation and thorough washing. This, of course, would weaken the print somewhat.

Moonlight Effects with Bromide Paper.

BROMIDE paper of the slightly mat surface variety lends itself especially well for the suggestion of moonlight effects. The negative may in this case be one of rather strong contrasts. In fact, one may sometimes in this way utilize a negative which is too plucky for daylight effects. The print should be sufficiently but not excessively exposed. Development should be fully carried out. The print is fixed and washed in the usual way.

We have now two courses open to us. First, that of staining the paper to a rather strong Prussian blue tint. This may easily be done by using the penny packets of dyes obtainable at any oil and colour shop. For our purpose the solution should be fairly strong, so that if the paper is stained too dark we may lighten the tint by subsequent washing in running water. If the solution is made too dilute we may not be able to stain the paper dark enough.

The second plan is to make an extra dark print and to tone it in either of the baths Nos. 3, 4 or 5 given on page 64. Subjects showing strong light and shade effects, *e.g.*, trees, buildings in sunshine, often make good moonlight effects.

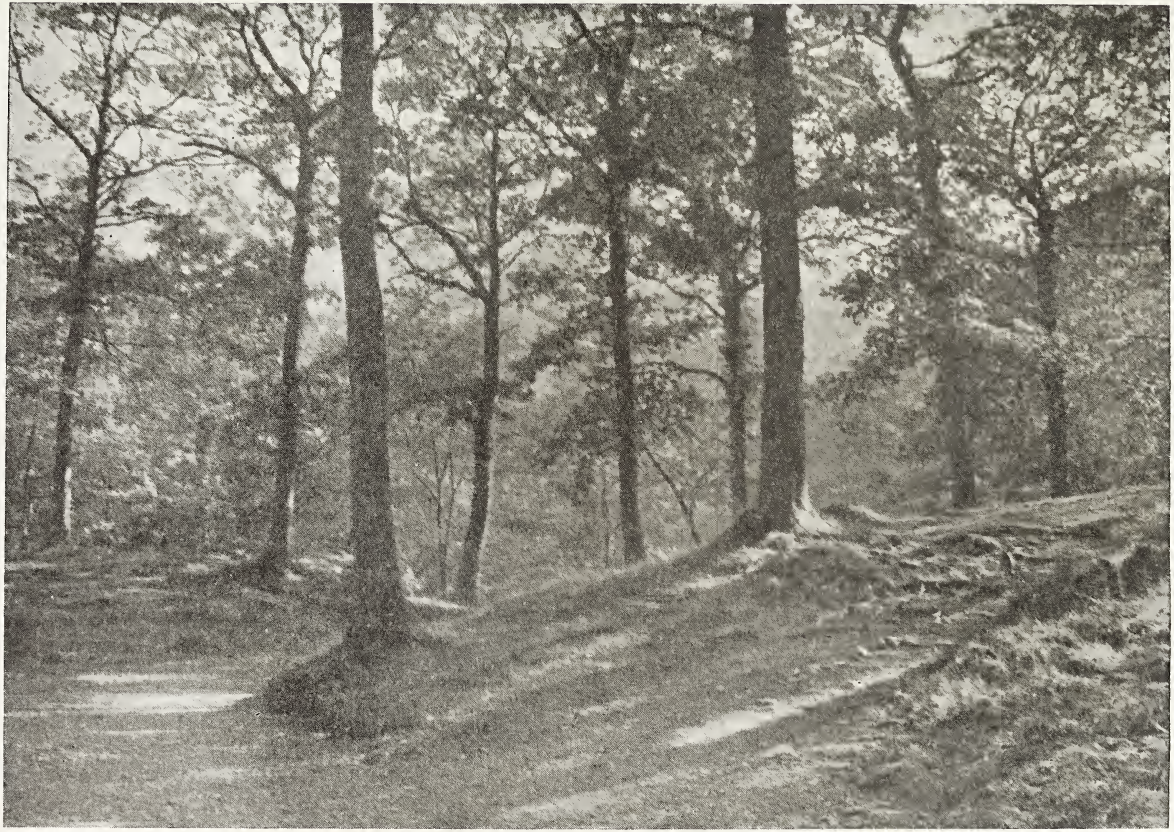

Fig. 19. F. C. Lambert.

BROMIDE PRINT TONED BY THE IODINE AND SODA SULPHIDE PROCESS.

The Iodine or Chlorine and Soda Sulphide Toning Process.

F. C. LAMBERT.

THESE two closely allied processes deserve to be better known. The reader is advised to make the following experiments. In 2 oz. of water dissolve 10 grains of Potassium Iodide. Then throw in one or two flakes of iodine, and stir until the solution is a dark sherry colour. In this immerse your bromide print. The paper quickly turns a dark blue, and the image gradually fades away, or more nearly resembles a negative. Now clear away the blue stain by immersing in a solution of soda sulphite ½ oz., water 4 oz. See that all the blue stain is removed by looking through your print; then wash well. Then immerse in soda sulphide 5 grains, water 1 oz. A rich brown image is the result (see fig. 19). Again wash well and dry. This process *apparently* reduces the contrasts by the change of colour. Give the print plenty of time in the soda sulphide bath.

Soda sulphide is not to be confused with sulphite or sulphate. It is a crystalline substance, somewhat deliquescent, and so should be kept well corked. If it deliquesces the fluid may be used; say 5 to 10 drops to the ounce of water.

Chlorine process. In a pint of water put a good teaspoonful of "chloride of lime," or "bleaching powder." Stir well and then allow sediment to subside. Pour off the clear part. To it add a few drops of hydrochloric acid. In this immerse your print until more or less bleached. Now wash well in water and darken with the soda sulphide bath as before. In this case the colour imparted is more yellow and less brown than in the iodine bath.

The Copper Toning Process.

FORMULA.

Copper sulphate (10% solution)...............	75 parts.
Potassium ferricyanide (10% solution) ...	66 ,,
Potassium citrate (10% solution)...........	570 ,,

For the following notes I am indebted to Mr. H. W. Lane, who has most kindly and unreservedly placed his experience and experimental results at my disposal. His experiments were made with a bath prepared by dissolving one of Burroughs Wellcome & Co.'s copper toning Tabloids in one ounce of water. This yields a bath of just half the above strength, and consequently acts more slowly, thus giving more time for observation. Prints must be washed quite free of hypo, otherwise the ferricyanide would, with hypo, form a reducer. To ensure even action, prints previously dried should be well saturated in cold water before toning is attempted. The developer used has apparently some influence on the resulting tone. Thus hydrokinone-developed prints *do not*, but amidol-developed prints *do* tone satisfactorily by this process. Should pink staining of the high-lights result, which seems to be the case with some papers, it may be prevented by doubling the proportion of the P. citrate. Copper toning seems to be suitable for matt surface papers only. With ordinary bromide papers the change of tone-colour proceeds regularly from black to warm photo-chocolate, and to red chalk or Bartolozzi red (fig. 20). But in the case of some gaslight papers the toning must be pushed to the red stage, otherwise "double toning" or uneven action results. Mr. Lane has some copper-toned prints dating from the year 1900, which at present show no sign of change.

The following series of colours were obtained on bromide paper: Warm black (1 minute's toning), plum purple (3 minutes), bluish terra-cotta (6 minutes). With Gravura: 6 minutes gave a more decided red chalk—i.e., less inclined to blue. Occasionally a developed print has an unpleasant rusty or greenish tinge. In such case a brief immersion in the copper-toning bath suffices to produce an appreciable and agreeable change of colour. The time of immersion in such cases need not be more than ½ minute.

F. C. L.

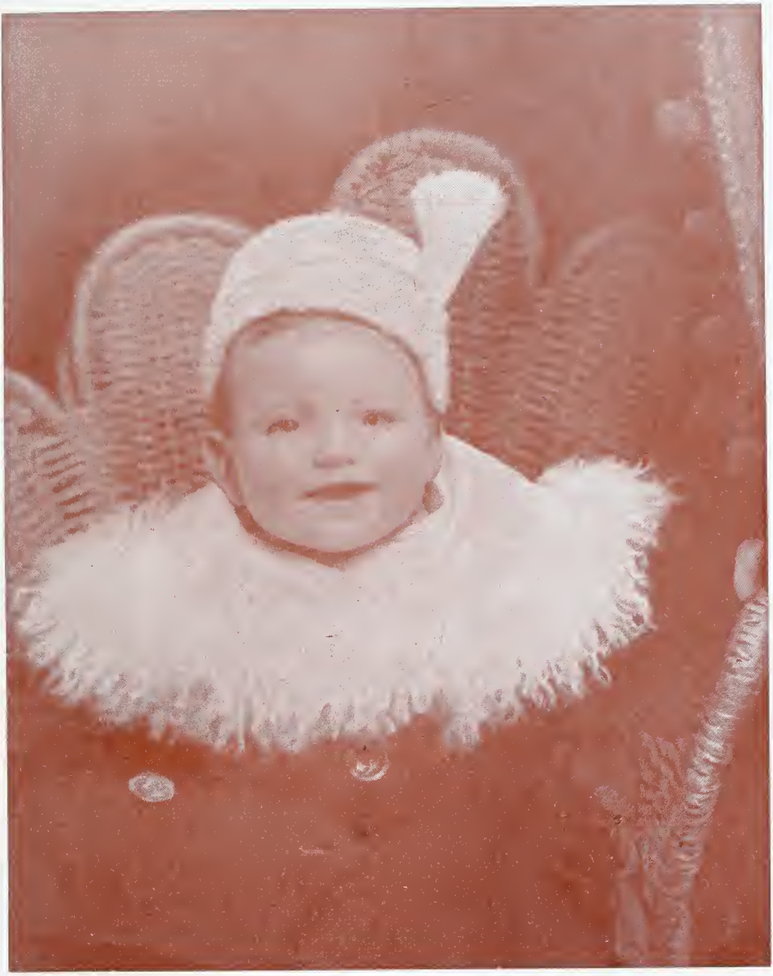

Fig. 20.

H. W. Lane.

BROMIDE PRINT, COPPER TONED.

A Chat with Dr. Chas. F. Grindrod about his Method of Working Bromide Paper.

EVERYONE in the photographic world knows quite well that Dr. Grindrod has specialized on the subject of Bromide Paper printing and that his experience in connection with the widely popular hypo-alum toning bath is so extensive that an opportunity of a chat on this and kindred topics was a chance not to be missed. The following notes are a resumé of a long morning's fascinating talk. Point after point in his practice was brought up and promptly noted.

For the most part his original negatives are 5 × 4 size. He is in favour of getting a good sharp focus. When developing, he aims at moderate rather than strong contrast or vigour, as his negatives are designed for enlarging purposes. Roughly speaking, these 5 × 4 negatives are usually enlarged about three-fold, *i.e.*, to 15 × 12.

Two kinds of bolting silk—fine and coarse—are in use, as occasion may require, but sometimes neither are used. The enlargements are made by artificial light. His favourite developer is a metol-quinol mixture. Amidol is not a particular favourite with him. As the hypo-alum toning process tends to slightly reduce apparent contrasts, due allowance for this has to be made when developing. After developing, the print is fixed in the ordinary bath. After this it has a rinse for a minute or two in a "salt bath." This is compounded by dissolving a good handful of table salt (sodium chloride) in, say, a gallon of water.

After the salt bath the print goes into an alum bath (3 ozs. alum to 60 ozs. water). Here it remains two or three minutes. Not longer, for prolonged immersion in the bath tends to markings which are difficult to remove. The alum bath is followed by a few minutes' rinsing in water and then the print is hung up to dry by pinning its edge to a shelf or lath.

Toning. First to prepare the bath. Dissolve 10 ozs. of hypo in 70 to 80 ozs. of hot water; when this is quite dissolved, slowly add 1 oz. of powdered alum, stirring well all the time. The previously alumed and dried print may be put into this bath at say 80°—100° F. By means of a gas-ring burner below the dish its temperature is gradually raised to, but must not exceed, 115° F. The bath should be gently rocked continuously. Toning takes 30 to 40 minutes. Several prints may be in the bath at one time. If they are kept face upwards their progress in toning can be watched without withdrawing and therefore cooling them. Due care must be taken not to abraid their surfaces, as at this temperature the gelatine is in a very delicate condition.

A small wooden thermometer is kept in the bath all the time. A bit of wire or string is tied round the thermometer at the 115° mark, so that when the figures are worn away, as they soon will be by the hot liquid, the maximum temperature mark is thus retained.

When the desired colour is reached the gas may be turned off and the bath allowed to cool a little.

When toning is complete, the print is withdrawn from the warm liquid and held up in the air to drip and drain, and at the same time to cool down slowly. For if it were immersed while hot into cold water it is possible that blisters may result.

After the toning bath the print again passes into the salt bath—same composition as before mentioned. Here it remains about one minute, at a temperature of say 70°F. or so. The print now passes once again into the alum bath for say 7 minutes, and is finally washed under the tap in gently running water for 1½ to 2 hours.

Each print is taken separately from the alum bath and gently brushed back and front with a soft wide camel-hair brush. This may be done while

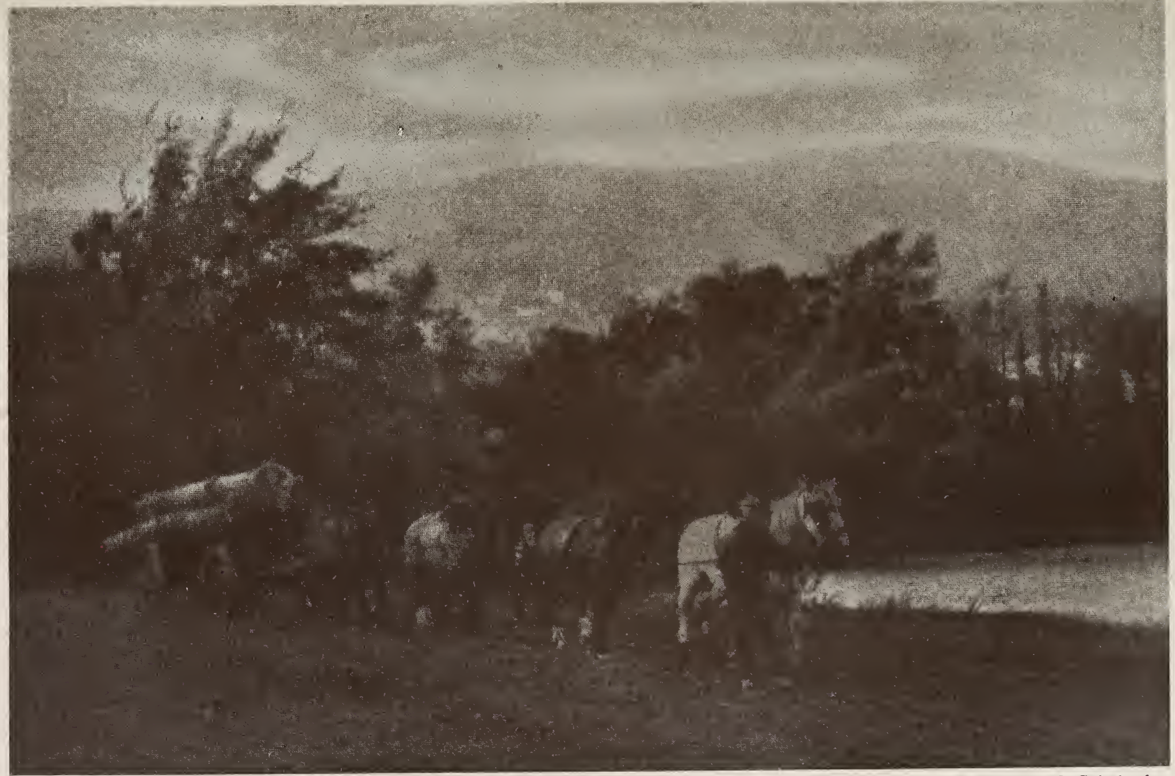

Fig. 21.

Chas. F. Grindrod.

BROMIDE ENLARGEMENT TONED BY HYPO-ALUM PROCESS.

the print lies on a slab of stout glass and is under the rose tap, but preferably while in a shallow dish of water.

Dr. Grindrod is in favour of drying the prints as quickly as conveniently may be by putting them in a warm room heated by a gas flame.

Important Points.

By a "new bath" is meant one that has not been much used for toning. A new bath shows more reduction effect than an old bath. For this due allowance must be made in developing. Hence, a new bath would be selected for use with a much over-developed print. Double-toning, if we may borrow a familiar term, is more liable to result from the use of an old worn-out bath. An old bath gives us "warm engraver's black" colours, with a slight tendency to purple or brown (fig. 21). A new bath, on the other hand, gives a more crude (yellower) brown.

Ripening a new-made bath.

This should be done the day after a new bath has been made up. It simply consists of putting an old print—a "waster"—into the new bath, and then heating it up to the usual temperature for an hour or so. This may be repeated on a second day. The result of this operation seems to be to take off the "sharp edge," as it were, of the bath; to moderate its action and cause it to yield more agreeable cooler colours.

Storing Prints.—After the prints are quite dry they may conveniently be put in a large scrap book, under pressure so as to keep them flat.

Do not filter the bath at any time. The milky deposit of sulphur is necessary to its satisfactory action.

Adapt the colour to the subject. There is no rule in this matter.

Change of colour on drying.—A print, when dry, looks a little darker, and also colder in tone, less red, more blue, than when wet; and due allowance for this must be made.

Alum markings may usually be removed by gently rubbing with wash leather.

Washing, Drying, Trimming and Mounting Bromide Prints.

THE permanence of bromide prints chiefly depends upon thorough fixing and washing.

Prints should be in the fixing bath for not less than ten minutes, and turned over one by one at least twice during this time.

Washing should be for at least one hour in running water, or in six changes of five minutes each.

Prints may be conveniently dried by pinning one corner of a small print, or two adjacent corners of a large print, to the edge of a wooden shelf. Or they may be laid face upwards on blotting paper. They should not be dried between sheets of blotting paper.

When trimming bromide prints, cut them with the face downwards on stout card; cut with a slight bevel edge, so that when mounted the white edge of the paper may not show.

A teaspoonful of white starch is put in a small basin with a tablespoonful of cold water. Rub with a spoon to a white cream. Now pour boiling water on the mixture till it just clears to a transparent fluid. Set aside to cool. When cold this forms a jelly. Use this as a mounting paste. Starch paste should not be used more than 24 hours old.

Soak the prints to be mounted in cold water. Lay them in a pile face down on a sheet of clean glass. With a roller squeegee press out as much water as possible without injuring the prints. With blotting paper dry the back of the top print, then apply the starch paste; lift up by the edges only, apply to the mount and press down with a handful of clean rag formed into ball. Use a rocking rather than a rubbing motion when pressing down. Lay the mounted print face upwards on a table to dry, in a cool place away from dust.

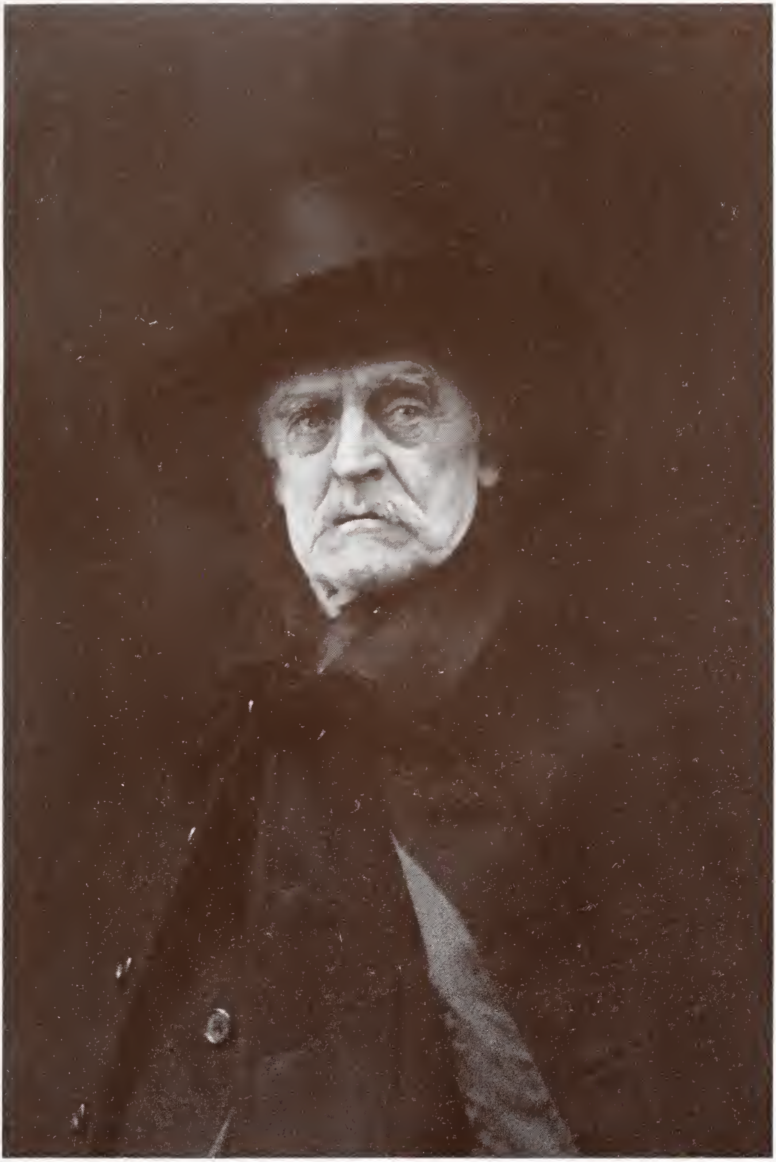

Fig. 22. F. C. Lambert.

URANIUM-TONED BROMIDE PRINT.

Clouds and Sky in Bromide Printing.

By J. C. ALLAN.

A "bald-headed" bromide print is quite as bad as a bald-headed lantern slide. The beginner may be told that bald-headed here means white paper where there should be cloud and sky. Now, we have two kinds of negatives to deal with. First, those having clouds, but too dense sky to print without some dodging. Secondly, those having no clouds of their own. In this latter case we must add clouds from some other negative.

First, suppose your negative has its own clouds, but that they do not show in the print. You may deal with such a negative in two different ways. Give double the exposure that seems necessary for the land part. Then start development with a very dilute developer. As soon as the sky line shows, wash off the developer. Lay the wet print on a sheet of glass or, better still, a slab of vulcanite, and with a brush or plug of cotton wool apply a fairly strong developer to the sky part only, holding the print with the sky part downwards so that none of the strong developer runs on to the land part. Then, as soon as the clouds are coaxed out to about half the strength you want them, apply the strong developer all over the print. This will bring out the land and sky part still further.

The next method is to shade the land part during part of the printing time. Place the printing frame on edge on a table. Sit with your back to the lamp so that its light comes over your shoulder. Then with a piece of card cut to the shape of the land (up to the sky line), shade the land part as soon as it has had enough exposure, but go on exposing the sky part. The shading card must be moved slowly up and down all the time the sky is getting the extra printing. The shade is moved up to the top of the printing frame and only down as far as the sky line. The exposure time of each must be found by using trial strips for each part. The exposure for a strong sky may be several times that for the land. For instance, the land part may require 10 seconds' exposure at 4 feet from the gas jet, and the sky and cloud part *may* require an additional 40 or 50 seconds. Of course, the two methods just described may be employed in conjunction with each other.

Next as to printing in a sky from a separate negative. The best way to make a mask is to use a piece of bromide paper—just in the ordinary way. Give a rather short exposure and let it develop out as much as possible. Well fix and rinse for a few moments. Then mount the print on to a bit of card of any kind cut to the exact size of the front of the printing frame, but be careful to mount your print so that it also exactly corresponds with the opening of the front of the printing frame. Fasten this card to a table or wall by tacks through its corners so that it will dry quite flat. When dry cut along the sky line with a sharp knife. If now the land part of the mask is laid on the face of the frame, corner to corner, the edge of the cut card should correspond exactly with the sky line of the negative. If the sky of our landscape negative is fairly dense we shall not need to use the sky mask, but we may want it if the sky is thin or has scratches or defects.

First print the land part in the usual way, but before removing the exposed paper, mark on the back of it the two top corners by a pencil mark, so that when changing the negatives you may not get confused as to which is land and which sky. It is convenient to use a second printing frame of the same size as the landscape negative for holding the cloud negative. To the front of this is fixed by drawing pins the land mask. Having put in the paper ready for the cloud printing (care being paid to putting it right way up), close the frame and then cover the entire face of the frame, mask and all, with a sheet of tissue paper. This will soften the edges of the mask and prevent junction lines. This is best for large sizes. But if small prints are being made this softening of the edges may extend too far. In that case do not use tissue paper, but simply the mask, and gently rock the frame about the sky line as an imaginary axis and so soften the masking line. Just how much to rock partly depends upon how far you are away from the light. The nearer the light the less the rocking angle. But this can only be learned by a few trials. All this may sound a great deal of trouble, but, as a matter of fact, it takes less time and trouble to do than it does to read this description.

Double-Toning of Bromide Prints.

AS a general rule double-toning effects in photography are not very satisfactory from a pictorial point of view. But "to every rule an exception." If the reader will carefully read the toning formulæ given on page 64, he will see that the colours obtainable are to some extent variable at will. If, then, we take a well-washed print and lay it on a sheet of glass, vulcanite, or other flat support, it is an easy matter to locally apply our toning solutions by means of a soft brush or tuft of cotton wool.

Thus in a sky and sea subject we may tone the whole print to a pale blue colour and then by local treatment give the near water and over-heavy sky a slightly greenish tinge Or, in a mountain subject, parts may be toned brown by uranium and other parts have a greenish hue suggested by uranium and iron combined.

But in all cases it is well to be content with slight suggestions of colour only, as double-toned strong coloured prints are very apt to look too crude.

Pictorial Pointers for Bromide Paper Printers.

By J. C. ALLEN.

THE pictorial worker regards his negative as only a means to an end. The best negative is the one which gives him the nearest approach to the effect he desires.

The choice of a paper

This is an important matter. A rapid paper gives a softer, less contrasty effect than a slow paper. Hence for negatives with excessive contrast use a rapid paper, and for negatives too flat, too contrasty, employ a slow paper.

A rough surface paper gives more breadth of effect—suppressing minute details and better lends itself to the suggestion of atmosphere than does a smooth or glossy paper.

A warm self-toned paper is best for warm coloured images obtained by long exposure and slow development, or by toning.

Very rough papers are not generally desirable for quite small prints.

Effects of varying the exposure and development.

Prolonged exposure tends to reduce contrasts. Hence, if the scale of tones in the negative is longer than the paper can render with normal printing exposure, then increase the exposure.

Conversely, shortening the exposure within certain limits tends to accentuate the light and shade contrasts of the print.

In general, prolonging development tends also to accentuate contrasts, (but is also liable to stain the paper).

Shortening development in general has an opposite effect, giving softened contrasts.

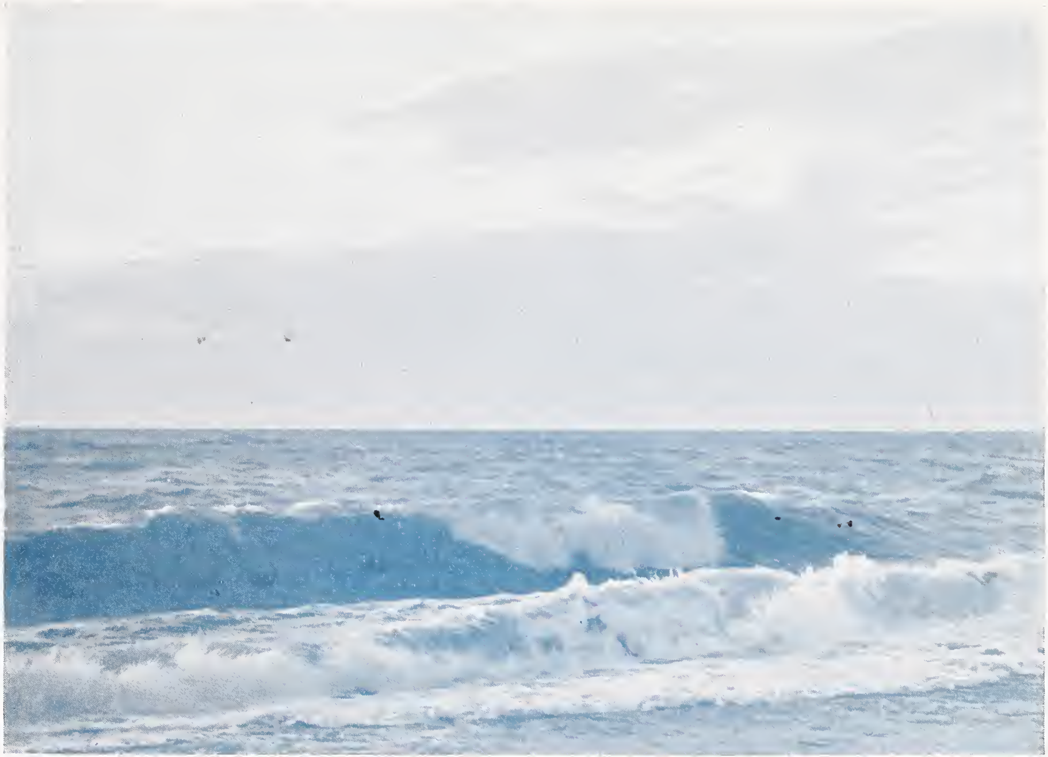

Fig. 23. F. C. Lambert.

BROMIDE PRINT TONED BLUE BY IRON PROCESS.

Diluting the developer slows its action, and in general has an effect opposite to that of prolonging the exposure.

Hence for soft misty "gray day" effects give a full exposure and use a dilute developer. For bright "sun and shadow" sparkling effects, reduce the exposure to the practical minimum and prolong the development.

Increasing the proportion of bromide or other restrainer tends to emphasize contrasts, especially during the earlier stages of development.

Local development may be practised in several ways. For example: (1) A very dilute developer may be applied long enough to just and only just bring out enough of the image to serve as land-marks for local application of stronger solutions. (2) The paper may be coated with glycerine. This is allowed to penetrate the paper, and superfluous glycerine removed by placing between two sheets of clean blotting paper. A weak developer (half water and half glycerine) is now applied all over the print until the "landmarks" are just visible. Stronger developer also containing half glycerine and half water is locally applied. (In general the procedure is similar to the glycerine method of developing platinotypes). For local treatment the following aids may be mentioned for large prints: A piece of very soft sponge held by thrusting a part of the sponge into the neck of a bottle. A tuft of cotton wool may be tied with thread to the end of a glass rod. A tuft of cotton wool may be held by a pair of vulcanite forceps or one's finger and thumb (though they are not to be recommended), or a soft camel's hair brush. The flat varnish brush shape and also the mop shape in quill are both useful.

All such brushes, sponges, etc., should be thoroughly well washed both before and after use.

To support the paper during local treatment we may for small sizes conveniently use the flat bottom (inside) of an ordinary porcelain or vulcanite or papier maché tray; for larger sizes a stout sheet of glass; for still larger sizes a drawing board covered with good quality smooth white American cloth, folded over and tacked along the edges of the board.

Local control in the printing frame.

This is best done by using a piece of stout card cut to the required shape. This may have a serrated edge for sky or foreground assistance, or a hole with serrated edges cut in it for local aid at any point within the picture.

Place the printing frame on a table or shelf. Stand or sit with your back to the light, and keep the card moving all the time the extra printing is being given to this or that part, so as to avoid sudden transitions.

A strong contrasty negative requires a strong light, i.e., bringing the printing frame near the light. Weak negatives or those of feeble contrast are best printed further away from the light, or the light may be subdued by covering the face of the printing frame with one or more thicknesses of tissue paper, or of ground-glass or of white opal glass. Tissue paper has this advantage: We can, if desired, cut out various sheets to required sizes and so locally control printing. If ground glass be used certain parts can be rubbed with charcoal or crayon, and so act as local printing retarders. Where such local printing control is being used, the printing frame should be kept moving during printing with a kind of wobbling motion.

Contrast changes of density are also under our control to some great extent by intensification or reduction.

Intensification and reduction.

In general, intensification tends to increase contrasts as well as density, for this due allowance should be made when developing. Reducing by the Hypo and Ferricyanide method tends to increase contrasts. But if the Ammonium Persulphate method be used it tends to reduce contrasts.

Intensification and reduction of the print should only be attempted when all other methods have been tried and failed, as both these methods of after-treatment are apt to be irregular and show most when they are least wanted.

Toning.

Toning gives us a choice of many colours, and one need hardly say that the best toning bath is that which gives us the nearest approach to the ideal colour required for the particular subject. Each subject must, of course, be treated entirely on its merits.

Toning in some instances (e.g., uranium) also means accentuating contrasts. In others (Hypo and Alum) the contrasts often seem to be slightly reduced. The copper method is somewhat irregular, but the density changes are not very marked. Local or double toning has been advocated, but it is of *very* doubtful pictorial value. The pictorial worker must always bear in mind the difference in colour and in strength that exists between the same print when wet and when dry. Drying dulls the surface, darkens all the tints, and changes the colour in a way not easy to generalise beyond saying that the colour is more pronounced, more red, or blue, or brown as the case may be, when wet than when dry.

Local treatment of the dry print.

White specks, such as dust spots and air bells, first need attention. Dark spots may be removed with the retoucher's needle or the point of a narrow knife blade. These are merely mechanical defects.

For local strengthening we may use crayon in cedar, or larger crayon with the usual holder; for larger passages powdered black chalk, obtainable at the Artists' Supply Stores, or powdered vine charcoal applied with the tip of the little finger, a paper or leather stump, a bit of wash leather over the finger end, or a stumping brush. The finger tip is most sympathetic of course.

To take out lights, ink eraser may be used, but this requires great patience, and must be done very gradually.

For lightening small passages a suitable sized hole should be cut in a bit of thin celluloid, laid over the place and the ink eraser used. This limits the rubbing action in a very convenient way.

Water colour, black or otherwise, to match the toning colour may be used.

Some of the smooth Bromide papers have a rather greasy feel, so that chalk or crayon does not "take" very kindly. In such case the print should be very gently rubbed with the tip of a finger or ball of the thumb, previously dipped in very finely powdered pumice stone or cuttle fish. A print that has been dipped in methylated spirits and then allowed to dry has a slightly rougher surface than otherwise it would have.

But as few pictorial workers are likely to use very smooth surface papers, we need not further dwell on these points.

The difference made by using a white or tinted paper is well known to the water colourist. Photographers should take this hint. A black and white print on white paper may sometimes be vastly improved by steeping it in a strong infusion of household tea or coffee (cold of course), and then after blotting off the surface liquid, hanging up to dry without any washing. For other effects the small packets of dyes sold by the chemist may be tried. These, however, are usually too crude or vivid, but may be toned down by blending. A few drops of good black (not blue) ink are useful in this connection.

The pictorial photographer is not very likely to want to locally colour or paint his bromide prints. But should he wish to experiment in this direction, he may be glad to know that the print will "take" the ordinary water colours all the better if it is first washed over with water containing a few drops of prepared oxgall. The water used with the colours should also have a few drops of gum arabic solution added thereto.

Sometimes a print which looks "just right" when wet is quite disappointing when dry. This wet appearance may be in some measure restored by coating either the whole or part of the print, with a fairly strong solution of gum arabic in water.

Lustraline, a preparation sold by the Vanguard Manufacturing Company is also a valuable and effective aid in this direction.

Various varnishes as used by the oil painter have been suggested, but they are not to be recommended as they leave the print shiny.

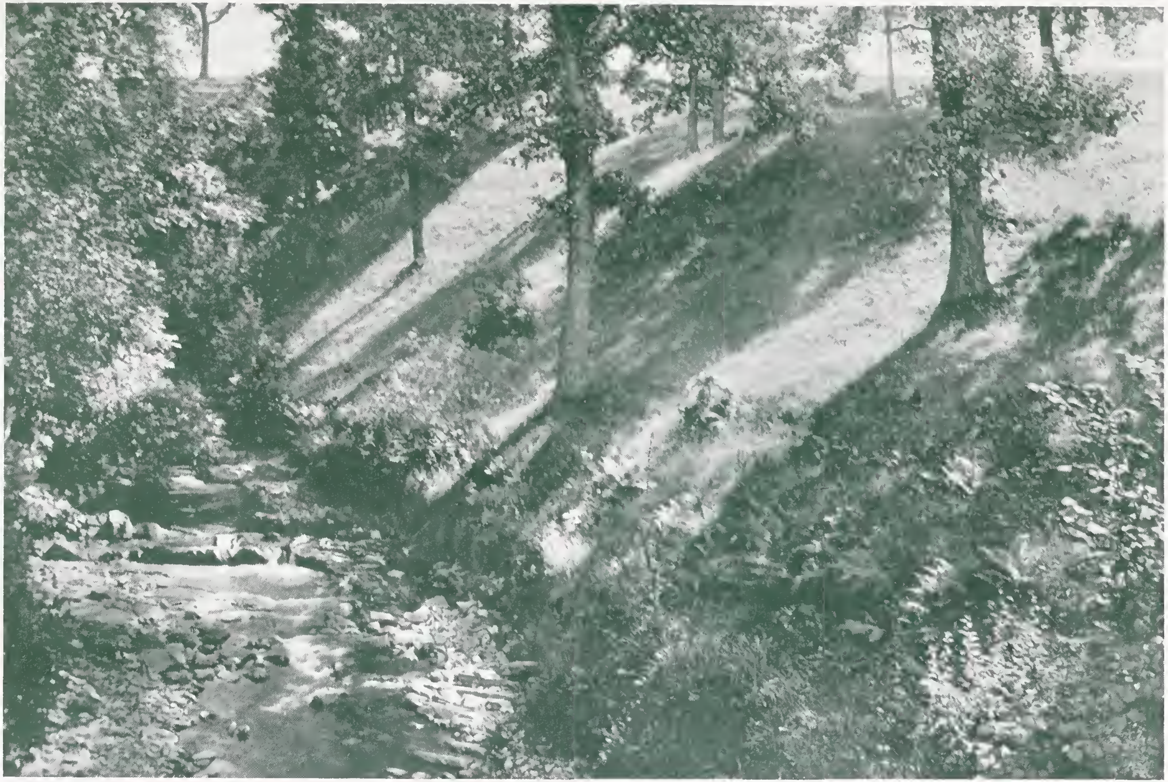

Fig. 24.

F. C. Lambert.

BROMIDE PRINT TONED BY IRON FOLLOWED BY CHROMIUM.

Suggestions for the Decorative Use of Bromide Prints.

By A. M. CLARK.

ORDINARY unmounted bromide prints on stout paper may be used as ménu or Christmas cards. Sensitized post cards are now an article of commerce, and special printing frames for use in connection with these cards are on sale.

Bromide Prints as Transparencies. — Bromide prints may be made more or less translucent by coating the back with Canada balsam dissolved in benzole, Xylol, chloroform or turpentine, or we may use vaseline, paraffin or glycerine, or the various varnishes used by the oil-colour artist.

White wax, spermaceti, or hard paraffin wax may be made to penetrate the paper, by first cutting the wax into fine shreds, and scattering these evenly over the back of the print, and causing them to melt, by holding a hot flat iron near, but not touching the print. Any excess of wax is removed by blotting off with rag or blotting board. Translucent prints may be used as lamp shades, hand or fire screens, window blinds, etc.

In such cases the print should be mounted between two thin sheets of glass, whose edges must be bound together with narrow strips of gummed thin tough paper, tape or ribbon, or the two glasses may be held together in a wooden frame, something like that used for the schoolboy's slate.

Light metal frames for holding window transparencies are also obtainable from the photographic dealers.

Prints on Wood Panels.—First coat the wood with gelatine mountant, and let this soak into the wood. When dry, coat again and mount the print. When the print is dry, its surface must be varnished to keep it clean. Prints in this way may be used to decorate hand or fire screens, door panels, lids of small boxes—*e.g.*, glove boxes, paper weights, overmantels, etc.

Bromide Printing.
Notes, Hints and Formulæ.

By **THE EDITOR.**

Some authorities recommend the following procedure when developing. Rinse out the developing dish with clean cold water. Pour out the water, leaving the bottom of the dish wet. Lay the dry paper on this wet surface and *at once* pour on the developer in one even sweeping wave as though developing a negative.

Bromide prints must not be dried by heat. Spots and stains may arise from neglecting to immerse the print face down in the fixing bath. Hair-like surface markings may be removed by rubbing the print, when quite dry, with a bit of rag moistened with methylated spirit.

To obtain a vigorous print from a thin flat negative, expose and then considerably over-develop a print. Fix and wash. Then immerse in reducing bath No. 4.

A bromide print may be converted into a line drawing by going over the parts to be retained with a pen and some waterproof ink. When the ink is quite dry dissolve away the silver image in any of the reducing baths given below. If they act too slowly more concentrated solutions may be used.

Blisters may be due to handling the wet print with warm fingers, or to passing the print from a strong and cold fixing bath direct to warmer tap water. Better to dilute the fixing bath with equal volume of water a minute before removing the prints. [See note *sub* fixing bath.]

To prevent blisters showing on a print. Rub a sheet of ground-glass with powdered talc, rub off, squeegee the print down upon the glass and strip when *quite* dry.

To impart a grained surface to a print, lay it face down on a sheet of fine "sand" or "glass" paper and pass the two together through the tightened rollers of a wringing machine, or put in a copying press, and give a good squeezing.

Developers.

1. **Amidol,** 25 grs.; soda sulphite, 300 grs.; potass bromide, 5 grs.; water, 10 ozs. Should be used within 24 hours of mixing.
2. **Metol,** 60 grs.; soda sulphite, 1 oz.; soda carbonate, 1 oz.; water, 20 ozs.; potass bromide, 5 grs.
3. **Quinol** (Hydrokinone). **A** Quinol, 50 grs.; soda sulphite, 150 grs.; water, 10 ozs. **B** Caustic soda, 10 grs.; soda sulphite, 150 grs.; potass bromide, 5 grs.; water, 10 ozs. Use equal parts A and B.
4. **Metol-Quinol.** Single solution. Metol, 25 grs.; quinol, 10 grs.; soda sulphite 300 grs.; potass bromide, 5 grs.; potass carbonate, 100 grs.; water, 10 ozs.

5. **Rodinal,** 2 to 10 drops; water, 1 oz.; potass bromide, 1 to 10 drops of 10 per cent. solution.
6. **Eikonogen.** Two solution. **A** Eikonogen, 45 grs.; soda sulphite, 250 grs.; water, 5 ozs. **B** Potass carbonate, 250 grs.; water, 5 ozs. Take equal parts of A and B and add one or more parts as greater softness is required. Recommended for vigorous negatives.
7. **Ortol.** **A** Ortol, 60 grs.; potass metabisulphite, 30 grs.; water, 10 ozs. **B** Soda sulphite, 2 ozs.; potass carbonate, ½ oz.; potass bromide, 10 grs.; water, 10 ozs. Use equal parts.
8. **Ferrous-Oxalate.** **A** Potass oxalate, 9 ozs.; water, 30 ozs. **B** Ferrous sulphate, 3 ozs.; water, 10 ozs.; sulphuric acid, 10 drops. **C** Potass bromide, 10 per cent. solution. Take 3 ozs. A, add to it (and not vice versa) 1 oz. B and 5 minims C. After developing, wash the print first in acetic acid, 1 drm.; water, 1 pint; then in tap water, and then fix in acid bath, No. 2.

Fixing.

1. Hypo, 4 ozs.; water, 20 ozs. (one pint).
2. Soda sulphite, 2 drms.; water, 20 ozs.; sulphuric acid, 10 drops; hypo, 4 oz.

N.B.—Dissolving hypo in water causes a fall of temperature. Therefore either use tepid water or prepare the bath several hours before use.

Intensification.

1. Mercuric chloride, 10 grs.; water, 2 ozs.; ammonium chloride, 5 grs. Bleach, wash very thoroughly and darken in any of the following baths. A. Strong ammonia, 10 minims; water, 1 oz. B. Soda sulphite, 50 grs.; water, 1 oz. C. Hypo, 10 grs.; water, 1 oz. D. Any alkaline developer which has not a large proportion of soda sulphite. E. Ammonium hydrosulphide, 5 drops; water, 1 oz. F. Soda sulphide, 5 qrs.; water, 1 oz. The foregoing not only intensifies but also imparts various shades of warm black or brown.

Clearing or Reducing Baths.

1. Thiocarbamide, 20 grs; citric acid, 10 grs.; water, 10 ozs.
2. Hypo, 1 oz.; water, 5 oz.; potass ferricyanide, 10 grs.
3. Ammonium persulphate, 10-15 grs. per oz. of water.
4. Potass iodide, 30 grs.; water, 10 ozs.; iodine, 5 grs. Refix in clean hypo fixing bath, No. 1.
5. Potass cyanide (caution! dangerous poison), 5 grs.; tincture of iodine, 5 drops; water, 1 oz. (Prepare the tincture of iodine by dissolving iodine in alcohol or methylated spirit until it is of a deep port wine colour.

Toning Baths.

1. Hypo alum. Hypo 10 oz.; water, 75 oz. Heat to near boiling and add slowly 1 oz. alum.
2. Uranium. Uranium nitrate or acetate, 6 grs.; water, 4 ozs.; glacial acetic acid, 1 drm.; pot. ferricyanide, 3 grs. This bath yields warm black, brown and dull red tones. (See fig. 22).
3. Uranium—Iron. Uranium nitrate, 6 grs.; water, 4 ozs.; acetic acid, 1 drm.; pot. ferricyanide, 4 grs.; ammonio citrate of iron, 5 grs. This yields greenish blue colours. By washing in sulphuric acid, 10 drops; water, 2 ozs.; a somewhat brighter colour is obtained. If the print is washed in ammonia, 5 drops; water, 5 ozs.; a violet tinge, which presently becomes a cool gray, results.
4. Ferric oxalate, 10 grs.; water, 8 ozs.; oxalic acid, 10 grs.; potass ferricyanide, 5 grs. This yields a greenish-blue colour.
5. Potass ferricyanide, 4 grs.; water, 2 ozs.; nitric acid, 5 drops; ammonio citrate of iron, 2 grs. Yields greenish-blue tones. (Fig. 23).
6. Copper. Water, 10 ozs.; potass citrate, 1 oz.; copper sulphate, 55 grs.; potass ferricyanide, 45 grs. Yields warm black, purple, brown and red tones.
7. Gold. Ammonia sulphocyanide, 20 grs.; water, 1 oz.; gold chloride, 1 gr.
8. Gold. Soda phosphate, 10 grs.; water. 5 ozs.; gold chloride, 2 grs.

Gold toning is useful when the developed print has a rusty, dull appearance. These baths also slightly intensify the print.

9. Iron-chromium process. Impart a slight blue tone in the iron bath, No. 5, wash briefly and then immerse in chromic acid, 4 to 5 grs.; water, 1 oz. Prints require to be in the chromium bath some time. The stain is removed by washing in a strong solution of alum. (See fig. 24).
10. A. Potass bichromate 30 grs.; water, 1 oz.; hydrochloric acid, 10 drops. B. Schlippe's salt, 15 grs.; water, 1 oz. Bleach the print in A, wash well and transfer to B. This bath imparts warm red-brown colours.

Mountants.

1. Starch powder, one teaspoonful; cold water, one tablespoonful. Rub to cream and add enough boiling water to make a clear jelly.
2. Gelatine, $\frac{1}{2}$ oz.; cold water, 6 ozs.; soak for one hour. Melt by gentle heat. Add slowly, with constant stirring, 2 ozs. methylated spirit. When cold, add 10 drops carbolic acid. Stir well. Store in wide mouth well-corked bottle. Melt for use by placing the bottle in warm water.
3. For mounting on glass. Gelatine, 20 grs.; cold water, 2 ozs. Stand one hour, then melt by gentle heat.